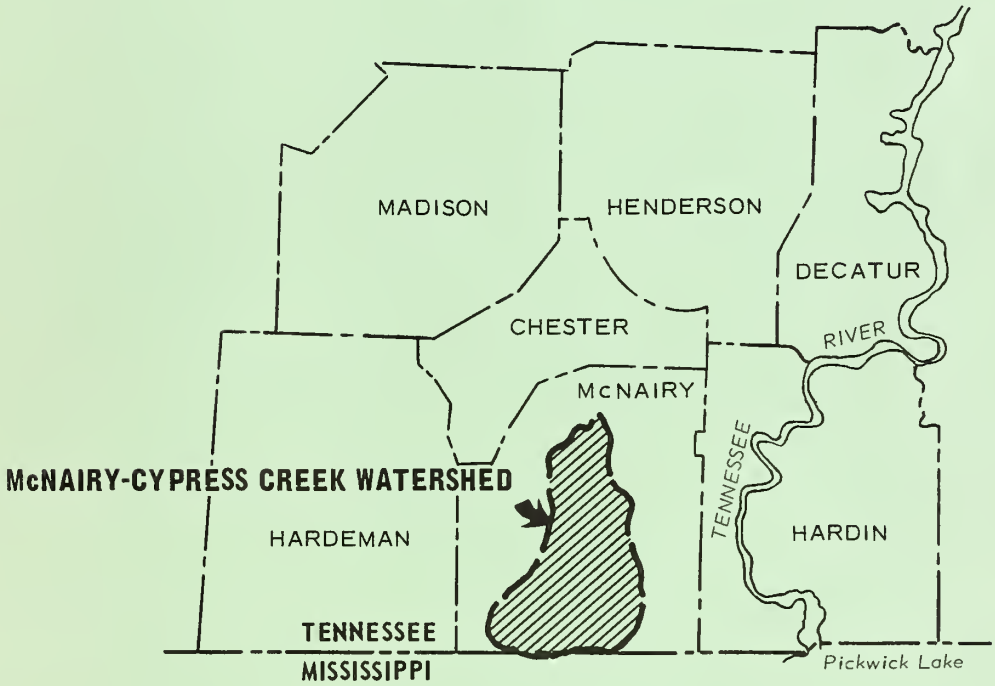
WATERSHED WORK PLAN

McNAIRY - CYPRESS CREEK WATERSHED

McNAIRY COUNTY, TENNESSEE



U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
AND
FOREST SERVICE

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WATERSHED WORK PLAN
McNAIRY-CYPRESS CREEK WATERSHED
McNairy County, Tennessee

Prepared under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress, 68 Stat. 666), as amended.

Prepared by: McNairy-Cypress Creek Watershed District
McNairy County Soil Conservation District
City of Selmer
City of Ramer

With assistance by:

U. S. Department of Agriculture, Soil Conservation Service
U. S. Department of Agriculture, Forest Service

November 1972

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SUMMARY OF PLAN

This is a plan for development of the soil and water resources in the 109,600-acre McNairy-Cypress Creek Watershed LOCATED within McNairy County in the southern part of West Tennessee. The plan was developed by the sponsors under the authority of Public Law 566, as amended, with assistance from the United States Department of Agriculture, Soil Conservation Service and Forest Service. The SPONSORS are:

McNairy-Cypress Creek Watershed District
McNairy County Soil Conservation District
City of Selmer
City of Ramer

Cypress Creek originates in north-central McNairy County and flows southward through the city of Selmer and central McNairy County. It empties into the Tuscumbia River about 1 mile north of the Tennessee-Mississippi state line.

The watershed has a long history of excessive erosion in the uplands and damaging sediment and flooding on bottom lands, which results in damage to crops, pasture, timber, roads, bridges, fences, commercial, industrial and residential property in the towns of Selmer and Ramer. Drainage is impaired throughout the flood plain. The social and economic opportunities of the nation and surrounding area have bypassed the once relatively prosperous watershed area.

The primary PROBLEMS in this watershed are an estimated $517,100 annual flood damage to:

(1) industrial, commercial, and residential properties in Selmer;
(2) crop and pasture values on bottom land; and
(3) other fixed improvements such as roads, bridges, barns, and fences.

Other problems are:

(1) lack of water based recreation near Selmer and Ramer; and
(2) no readily available water supply for industry at Selmer.

Flood damage is a direct result of channel overbank flow and accumulation of surface water during periods of high rainfall.

The principal OBJECTIVE of the sponsors is to improve the social and economic status within the watershed and surrounding area. The sponsors believe that project measures designed to reduce flood damages, erosion

and sediment production, and to provide storage of water for future industrial use and improve opportunities for recreation, will accomplish their objective. Installation of measures to reduce flood damage, attract industry and provide local residents an opportunity to more fully enjoy their leisure time will increase family income and standard of living with socio-economic enhancement throughout the area.

The WORKS OF IMPROVEMENT designed to help alleviate the flood problems, control erosion and reduce sediment damages along Cypress Creek will be installed during a 7-year period. The planned project measures are:

(1) conservation land treatment on 23,810 acres;
(2) stabilization of 5,360 acres of critically eroding uplands;
(3) 2 multiple-purpose structures--flood prevention with recreation and industrial water supply for Selmer, flood prevention with recreation for Ramer with basic recreation facilities for each structure;
(4) 18 floodwater-retarding structures and modification of the principal spillways of these structures to preserve and replace waterfowl habitat;
(5) 31.1 miles of stream channel improvement; and the construction of levees and installation of water control devices to provide seasonal flooding on about 1,000 acres of land for waterfowl habitat mitigation.

The land treatment measures, except critical area planting, will be voluntarily planned and applied by the landowners in cooperation with the programs of the soil conservation district. Such cost-sharing assistance as will be available under the Rural Environmental Assistance Program or other programs will be utilized in applying these measures. Technical assistance for applying and maintaining the forestry measures will be furnished by the U. S. Forest Service, by and through the Tennessee Division of Forestry. The Soil Conservation Service and Forest Service will use P.L. 566 funds to accelerate the technical assistance needed for application of the planned land treatment measures. Financial assistance will be provided to landowners from P.L. 566 for treatment of critical areas.

The project will benefit all of the 10,000 people who live and work within this watershed as well as other citizens who live in McNairy County. Tourists traveling to and from Shiloh National Military Park and others of the traveling public will particularly benefit from the recreation development. Four hundred and eighty farms comprising 12,470 acres of the flood plain and 15,830 acres of cropland will directly benefit.

Damage to residential, commercial, public and industrial property from the 25-year frequency flood will essentially be eliminated and there will be no apparent risk of loss of life. Damage to roads and bridges will be reduced by 68 percent. Erosion control measures will reduce sediment damages, improve water quality, and provide an increase in habitat of farm game.

The reduction in seasonal flooding will reduce the total acres of migratory waterfowl habitat. However, the installation of water level control devices and levees will insure that this habitat is preserved. Management of the sediment pools will provide additional waterfowl habitat and fishing areas.

The installation of recreation and water supply facilities will attract additional sources of outside income and bolster the overall economy of the area. Approximately 300 new jobs will be created in this economically depressed area.

The McNairy-Cypress Creek Watershed District will be responsible for the installation, operation, and maintenance of the critical area planting. The estimated INSTALLATION COSTS of the project measures are:

Project Measure	Installation Cost (Dollars)		
	P.L. 566 Funds	Other Funds	Total Cost
(1) Conservation Land Treatment	129,800	917,400	1,047,200
(2) Critical Area Stabilization	349,800	138,000	487,800
(3) 18 Floodwater-Retarding Structures Incl. Spillway Modification	2,226,400	638,100	2,864,500
(4) Multiple-Purpose Str. No.4, Incl. Basic Recreation Facilities	213,000	123,000	336,000
(5) Multiple-Purpose Str. No.13, Incl. Basic Rec. Facil. and Water Intake Structure	384,000	369,000	753,000
(6) Improvement of about 164,700 Ft. of Stream Channels, and Constructing About 10 Miles of Levees With Spoil Materials	644,600	164,900	809,500
(7) Project Administration	558,000	112,000	670,000
TOTAL PROJECT COST	4,505,600	2,462,400	6,968,000

Average annual BENEFITS to be derived from the project structural measures are estimated to be $610,450 and the average annual COST is $352,727. This yields a benefit-cost ratio of 1.7 to 1.0. Estimates indicate that about 9,000 people utilizing industrial and farm lands in the watershed will be directly benefited. About 12,470 acres will be directly benefited. The sponsoring organizations have the authority to plan and install the proposed structural measures and will be responsible for adequately PROTECTING, OPERATING, AND MAINTAINING the structural measures at an estimated average annual cost of $52,500.

This work plan was developed by the local sponsors with assistance from the U. S. Department of Agriculture's Soil Conservation Service and Forest Service and will be installed in 7 years. The project will be governed locally by elected officials.

FEDERAL financial and technical ASSISTANCE will be administered by the U. S. Department of Agriculture, Soil Conservation Service and Forest Service under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress, 68 Stat. 666), as amended.

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WATER RESOURCES - ENVIRONMENTAL SETTING

The drainage area of the McNairy-Cypress Creek Watershed is 110,000 acres. About 109,600 acres are located within McNairy County in southwestern Tennessee and 400 acres in northern Alcorn County in northeast Mississippi. The 400 acres in Mississippi are not included in this watershed plan since the land treatment and structural needs can be supplied by other programs. Cypress Creek, a tributary of Tuscumbia River of the Hatchie River Basin, rises about 10.5 miles north of Selmer, Tennessee, and flows southward. From its headwaters to its confluence with the Tuscumbia River, it traverses a distance of about 26 miles. Many diverse and individual problems are manifested within the watershed boundaries. Due to its variation in land, soils, and topography, a variety of measures are needed to meet the needs of the land and objectives of the local people.

Historical Data

McNairy County was organized by an Act of the General Assembly of the State of Tennessee on October 8, 1823, and was named in honor of Judge John McNairy of Nashville. The first settlers came from North Carolina, South Carolina, Virginia, and counties of Middle and East Tennessee. The county records were destroyed during the Civil War and most of the recorded early history of the county was lost.

The people who settled this county were hard-working, tolerable, thrifty, and moderately well-educated. With plentiful land but little concern for its conservation, many acres were left denuded and subject to the forces of nature. This lack of concern has taken its toll in terms of critically eroding and sediment producing areas and reduced stream channel capacities.

During the early period, there were few sawmills in the county and little or no lumber was shipped. The main object of the mills was to supply the home demand. The major forest areas were located in the western half of the county; however, a good stand of cypress trees stood along the main stream and it was from this growth that Cypress Creek derived its name.

Land was plentiful and prices ranged from $3 to $6 per acre for inferior uplands and $25 to $30 per acre for the best bottom land. The main staple crop was cotton, although a sizable acreage of corn was raised. Some wheat and tobacco were also grown but they could not be regarded as staples. Irish and sweet potatoes were raised for family use but not for market. Average yields per acre of the leading crops were:

Cotton	500 lbs.
Corn	20 bu.
Tobacco	700 lbs.
Wheat	10 bu.
Hay	1¼ ton

Nearly one-half of all the farms in the county contained 20 to 50 acres, while nearly three-fourths of them contained as many as 20 acres but less than 100 acres. The general disposition during this period was to cultivate less land, but cultivate it better.

Livestock, except as beast of burden, played a minor role in the early history of McNairy County. Most of the swine and cattle were slaughtered for home use, although some were marketed or swapped for other products.

Purdy, located on the northeastern edge of the watershed, served as the first county seat of McNairy County. The first courthouse, built in 1823, was a log cabin about 18x20 feet with a clapboard roof and puncheon floor. A more substantial brick courthouse was built in 1830. Fire destroyed this building in 1881 and it was never rebuilt. The county seat was later moved to Selmer.

Physical Data

Selmer is the county seat of McNairy County and serves as the major trading center for the area. It is located on the banks of Cypress Creek at the intersection of U. S. Highways 45 and 64, major north-south and east-west travel routes. Selmer is about 35 miles south of Jackson, Tennessee, and 19 miles north of Corinth, Mississippi. Memphis, one of the greater metropolitan areas of Tennessee, lies only 80 miles west of this watershed and has served as one of its major markets for cotton.

The watershed is also served by a network of secondary and farm-to-market roads and state highways. The Southern Railroad passes through the watershed at Chewalla on the southern edge and the Gulf Mobile and Ohio Railroad bisects the area in a north-south direction, serving Selmer and the communities of Guys, Ramer, Falcon, and Bethel Springs.

The land surface of the watershed is mostly low rolling hills and level bottoms. The maximum relief is approximately 350 feet; however, the average difference in elevation from ridgetop to valley floor is only about 100 feet. The streams have low gradients and broad flood plains. Some of the streams, especially in the lower reaches, have become clogged with sediment or debris and swamping or frequent flooding is the result.

The watershed has a temperate, rainy climate and seasonal changes are gradual. Winters are generally short and mild with a few inches of snow. The average summer temperature is about 73.5° F. Temperatures as high as 106° F. and as low as -12° F. have been recorded. Soils seldom freeze more than 3 inches deep and ordinarily thaw in 5 or 6 days. Data gathered by the Savannah Weather Bureau Station indicate that the average frost-free period is 206 days, or from April 3 to October 26. The growing season is usually long enough to mature all crops common to the area.

The average annual precipitation of 52.21 inches (Selmer, USWB Gage) is fairly well distributed throughout the year but is heavier during winter

and spring. Precipitation is lightest in the fall. However, there is generally enough rainfall to meet the needs of all crops, but much of the water runs off or evaporates. Lack of rain seldom causes crop failure but it does reduce yields.

Water for domestic purposes is supplied mostly by wells. These wells range in depth from 20 to 70 feet for the rural areas to 600 feet for one of the three large wells serving the city of Selmer. Selmer obtains its water supply for both domestic and industrial purposes from wells. Water for livestock is generally furnished by creeks and ponds.

There are only two lakes within the watershed. One is Big Hill Pond located in the lower end of the watershed that was created by the Southern Railroad fill. The other is Powell Pond on the west side of Cypress Creek just above its junction with Tuscumbia River. These lakes have surface areas of 22 and 57 acres, respectively, and are managed as fee fishing areas. A third area of somewhat smaller size, known as Baldwin Pond, is also managed as a fishing area. It is located on the east side of Cypress Creek near its outlet and consists of an old channel run closed off by past channel improvement. There are about 450 man-made ponds in the watershed with 50 over 1 acre in size.

The watershed lies within the Mississippi Embayment Section of the Gulf Coastal Plain physiographic province. Geologic formations exposed in the watershed range in age from Cretaceous to Quaternary. The geologic column representing the stratigraphic sequence of sedimentary layers exposed or near the surface is as follows:

System	Series	Formation
Quaternary	Pleistocene and Recent	Alluvium
Tertiary and Quaternary	Pleistocene and Pliocene	Fluvial Deposits
Cretaceous	Upper Cretaceous	McNairy Sand Coon Creek Formation Demopolis Formation

The Cretaceous formations underlie the entire watershed and dip gently to the west. The Demopolis Formation outcrops in the upper reaches of Muddy Creek. It is a massively bedded, micaceous, gray to bluish-gray marl, and has a thickness of about 150 feet. The overlying Coon Creek Formation is exposed principally in the central and eastern parts of the watershed. This formation is composed mainly of thin interbedded layers of gray to greenish-gray, micaceous, fine sand and clay. Maximum thickness is about 140 feet. The McNairy Sand consists of very fine to coarse-grained, crossbedded sands with local occurrences of thin bedded kaolinitic clay. This formation outcrops extensively along the western rim of the watershed and in the area north of Selmer. Maximum thickness of the formation in the watershed is about 250 feet.

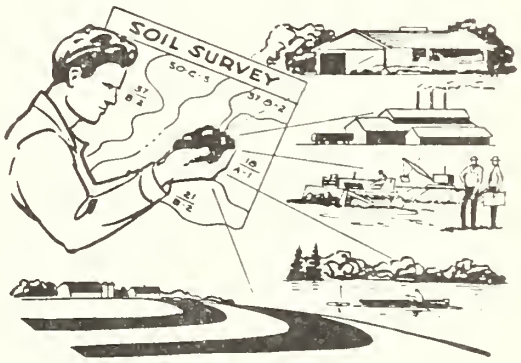
The Tertiary and Quaternary fluvial deposits are old, dissected flood plain materials above the level of the present flood plains. They consist mainly of sand and gravel with some silt. These deposits occur locally in areas adjacent to the present flood plains and may be up to 30 feet thick. The Quaternary alluvium is located in the present flood plain area of the watershed. These deposits include poorly stratified sand, silt, and clay with scattered occurrences of pebbles and gravel. A thin mantle of Pleistocene loess may be found in some areas where it has not been removed by erosion.

Surface soils vary in thickness from 4 to 42 inches, and are very productive where the subsoil is of the proper texture. The average depth of top soil is about 7 inches.

Soils in the watershed are classed into six major soil associations.

Area	General Soil Associations	Percent of Watershed
1	Ruston-Lexington	39
2	Ruston-Cuthbert-Lexington	6
3	Cuthbert-Ruston-Shubuta-Silerton	29
4	Boswell-Tippah-Oktibbeha-Shubuta	8
5	Ruston-Cuthbert	3
6	Falaya-Collins-Waverly	15

Area 1 encompasses the rolling and hilly area north of Oxford and Reedy Creeks. The soils on the hilltops are silty to a depth of 2 or 3 feet and sandy below that depth. Those on the hillsides are predominantly sandy. The only significant areas of level land are the narrow first bottoms along the crooked streams. The narrow bottom lands are mainly silty soils that are not well drained. The smoother areas of silty soils on hilltops and small tracts elsewhere in the uplands are used for crops. Much of the acreage of the sandy hillsides is in woods, but some has been cleared, farmed and is now deeply cut by gullies.



Area 2 is the southwestern portion south of Reedy Creek and west of Cypress Creek. It is a moderately steep to steep area with long, narrow ridgetops. A silty layer 2 or 3 feet thick covers the ridgetops underlain by unconsolidated sandy and clayey Coastal Plain material which is exposed on the hillsides. Thin platy ironstone or iron crust fragments can be found on the surface.

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Area 3 is the south-central segment, south of Oxford Creek and north of Indian Creek. The area is dominantly hilly. The hilltops are broad enough to accommodate 2 to 5-acre gently rolling fields. Areas of bottom land along the meandering streams range from a few feet to about 100 yards wide. The dominant soils in the upland have a silty or loamy surface layer a few inches thick and a reddish or yellowish plastic clay subsoil many feet thick. Small scattered tracts are silty or loamy to a depth of more than 3 feet. Many small tracts in the uplands are severely eroded and some are deeply cut by gullies. Crops of corn, cotton, soybeans, hay, and pasture are in small fields. Most of the steeper hillsides are in woods. The soils on the first bottoms are dominantly silty or loamy, but there are areas of sandy overwash in many places.

Area 4 is the southeastern part, east of Muddy and Little Muddy Creeks. The topography is dominantly hilly and the slopes along the drainageways are steep. There are small, undulating or rolling areas on top of the hills. Most of the level areas consist of narrow strips of bottom land. These soils are formed in clay deposits over, and in some cases weather from, the Demopolis Formation. Where the topography is suitable, a high percentage of land has been cleared.

Most of the row crops are grown on the gently sloping ridgetops, along drainageways, or on bottom lands. The side slopes are generally in trees, although some have been cleared for crop production. It is only on the steeper, cleared areas that sheet and gully erosion is a problem in this association.

Area 5 is the southern segment south of Indian Creek. It is a hilly and steep area that is deeply dissected by drainageways. There are two main soils in the uplands of nearly equal extent. One has a sandy surface layer a few inches thick and a clayey or sandy clay subsoil. Much of the upland is in woods. There are many idle tracts, some of which have been farmed, gullied, and abandoned. This area contains a small acreage of bottom land. It is in narrow strips and the soils are loamy and sandy and generally not well-drained.

Area 6 consists of the level flood plains along Cypress Creek and its many tributaries. The soils range from moderately well-drained to poorly-drained. They are dominantly silty or loamy, but thick deposits of sandy overwash are common in many places. Most of the area is cleared and cropped. Woods are on some of the wettest places.

Areas of sand overwash are common in this association. However, most of the flood plain has been cleared and is used for crop production. This area needs measures to help alleviate flooding and to reduce damage from sand overwash and sedimentation. Soil capability classes of this flood plain association are as follows:

Capability Class	Percent Distribution
I	9.1
IIw	69.6
IIIw	18.9
IVw	2.4

Mineral resources are few within this watershed. In the early days of clay mining in Tennessee, clays of the McNairy Sand were worked rather extensively. Continued demands from the ceramic industries for better clays has caused a decrease in mining and prospecting interest in this area. No clay mining is done at this time. There is some open pit mining for sand and gravel used locally on roads.

Ample groundwater supplies are available within the watershed area. Aquifers from the Eutaw, Coffee and Ripley formations all have good water supplies of good chemical quality. Most waters are calcium or sodium bicarbonate types with iron the most troublesome mineral constituent.

Cypress Creek has a stream pattern that has remained dendritic through three channel improvement programs in the past. Howell Pond and Baldwin Pond are old creek channels closed off by channel excavation.

The stream channel was modified in 1911, 1915, 1947-48. The lower 8 miles of Cypress Creek has perennial flow but all other streams are intermittent. The stream use classification set by the Water Quality Control Board is for fish and aquatic life.

Economic Data

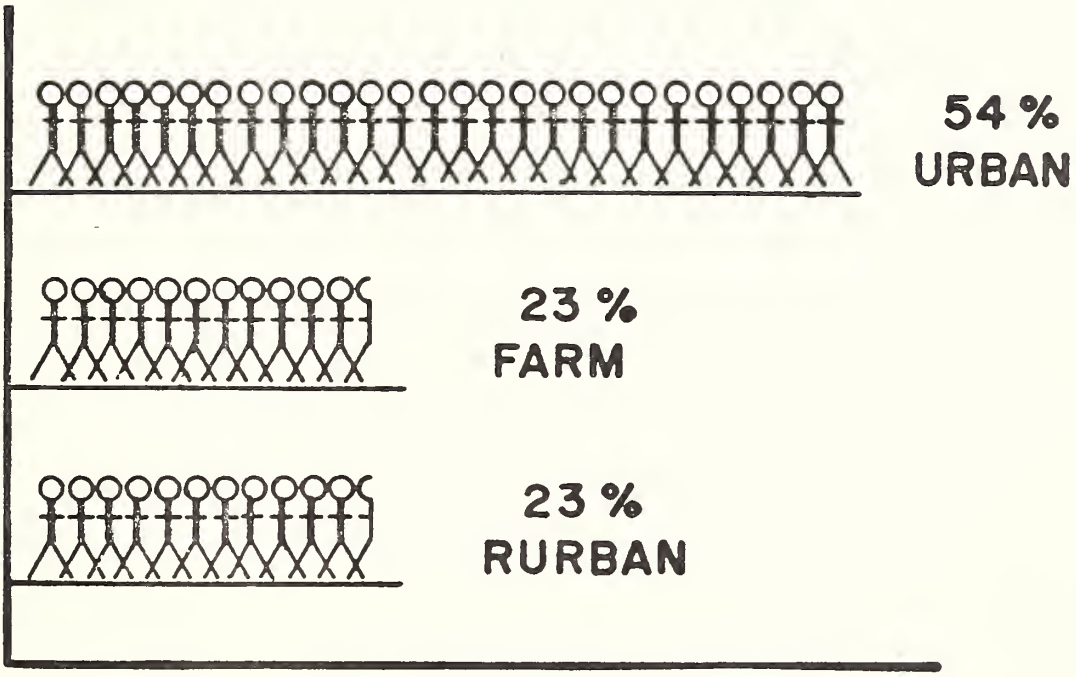
Cypress Creek Watershed comprises about 30 percent of the land area of McNairy County. All is privately owned.

McNairy County is eligible for financial assistance under the Public Works and Economic Development Act of 1965 (formerly the Area Redevelopment Act of 1961). As shown in the Overall Economic Development Program for McNairy County, Tennessee, dated 1962, the following factors have contributed to a lack of economic development:

1. The agricultural economy is shrinking.
2. Venture capitol is lacking.
3. Competition exists with other areas.
4. Skills are limited in the labor force.
5. An industrial atmosphere is lacking.
6. Many human and natural resources have not been fully developed.
7. Good woodland has been partially depleted by fire and poor management.
8. Young people migrate out as they graduate from high school in search of better employment.
9. There has been no coordinated effort to bring about economic development.

Distribution of the 9,000 population or 3,200 families in the McNairy-Cypress Creek Watershed is shown in the following graph:

GENERAL POPULATION CHARACTERISTICS
McNairy-Cypress Creek Watershed
1969



Estimates indicate there are 3,200 parcels of property of which 700 are farms. The average size farm is about 150 acres ranging from 10 to 800 acres. The average value including fixed improvements is $25,000. The average value of land in farm units ranges from $125 to $875 per acre, and the average value of flood plain land ranges from $150 to $1,500 per acre.

Agriculture remains the principal industry in the county but has undergone many significant changes in recent years. There are fewer but slightly larger farms. Higher production with increased mechanization now requires fewer farm workers. Row crops are being replaced by livestock and diversified farming. Many farmers work part-time in nearby towns and cities to increase their income level.

Incorporated towns within the watershed include Selmer, population 3,400; Bethel Springs, population 625; Ramer, population 400; and East View, population 425. These towns are the major trade centers. Statistical records indicate a slight population growth has occurred during the past decade.

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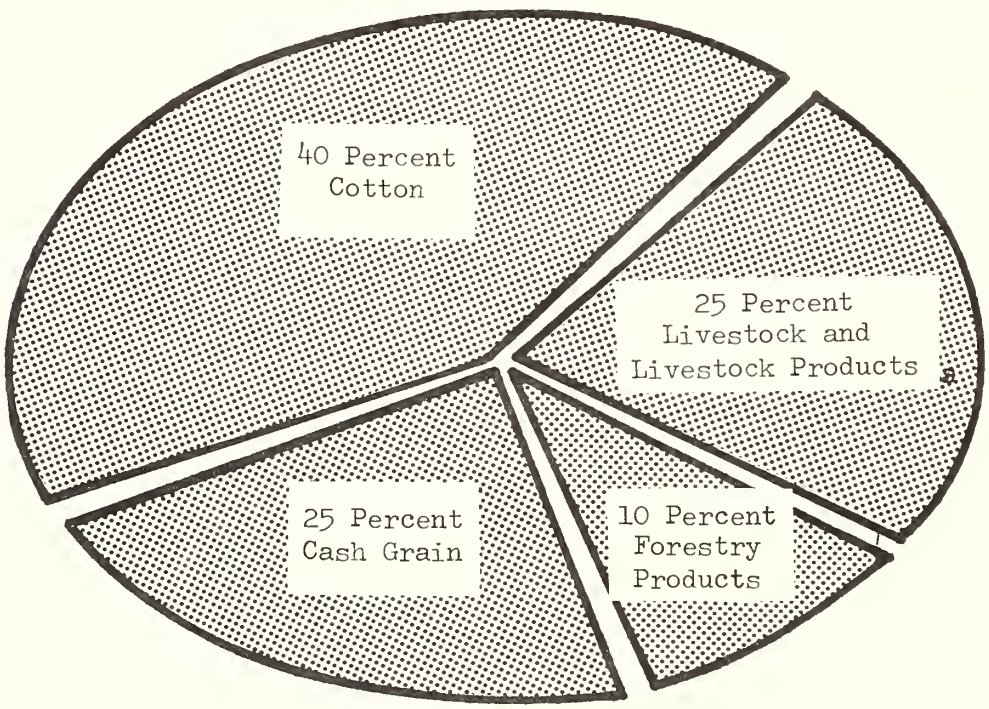
Estimates indicate that almost 50 percent of the cropland in the watershed is in the flood plain. Present land distribution is:

Land Use	Acres	Percent
Cropland	28,400	25.8
Pastureland	10,160	9.2
Forest land	65,300	59.4
Other	6,140	5.6
TOTAL	110,000	100.0

The economy of the area is almost exclusively dependent on agriculture. During the past decade, the number of farms in McNairy County has decreased about 50 percent causing a drastic reduction in the number of employed agricultural workers. The small farmer can no longer depend upon his low income, because year after year it becomes increasingly inadequate. Industrial movement into the South has created some jobs that are being filled by workers who have been full-time farmers.

The agricultural economy is tied primarily to the production of cultivated row crops, livestock, and livestock products. The major crops produced in the watershed are cotton, corn, soybeans, silage, small grains, hay and pasture. Cotton remains the leading cash crop. The major sources of agricultural income are shown in the following graph:

MAJOR SOURCES OF FARM INCOME
McNairy-Cypress Creek Watershed, 1968



Income From Specialty Crops is Less Than 1 Percent

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Markets for farm products within the area are considered to be adequate; although, shipping by truck and railroad to outside markets in Memphis, Jackson, Tupelo, and Florence is common practice.

A network of federal, state, and county roads provide easy access to markets and business areas. U. S. Highway 45 is one of the main north-south thoroughfares from Chicago to New Orleans. U. S. Highway 64 and Tennessee State Highway 57 are east-west thoroughfares from Memphis to Chattanooga. The watershed area is served by the Gulf Mobile and Ohio and Southern Railroads.

It is estimated that about 60 percent of the family-type farms are in the low income or economically depressed category. Data taken from the U. S. Census of Agriculture showing trends in the agricultural economy of McNairy County follows:

Item	Unit	Year			
		1954	1959	1964	1969
No. of farms	No.	2540	1866	1491	1478
Average size of farms	Ac.	104	114	130	146
Average per ac. value of land & bldgs.	Dollars	42	63	104	153
Owners & part-owners operating farms	Percent	67	71	78	73
Proportion of tenancy	Percent	25	24	22	13
Part-time farmers	Percent	21	42	43	27
Commercial farms	No.	1884	1138	1061	1051
Class I	No.	0	0	6	10
Class II	No.	10	6	23	30
Class III	No.	181	40	101	92
Class IV	No.	497	147	266	182
Class V	No.	791	440	345	288
Class VI	No.	405	505	320	248

Employment characteristics of McNairy County show about 33 percent of the population in the labor force. The following table shows employment characteristics.

Item	Year			(August)
	1940	1950	1960	1969
Total labor force	6340	6340	6351	5800
Total employed	6023	6175	5684	5520
Total unemployed	317	165	667	280
Percent of total labor force unemployed	5.0	2.6	10.5	4.8
Labor force as a percent of total population	31.0	31.0	35.0	33.0

Many of the employed are underemployed. In the past decade, many of the unemployed or underemployed have out-migrated from the area in search of employment or better employment in one of the large metropolitan areas. The highest proportion of out-migration has been in the 18-24 age group. The exact cause may be related to:

1. Industrial employment ratio of 80 percent women and 20 percent men;
2. The high percentage of population on the farm;
3. Mechanization and consolidation of farm operations;
4. Disparity of wages and income;
5. Increased awareness of a better way of life than that of a sharecropper or tenant; and
6. Lack of skills and adequate training program to retrain displaced workers.

SOLID FOOTING

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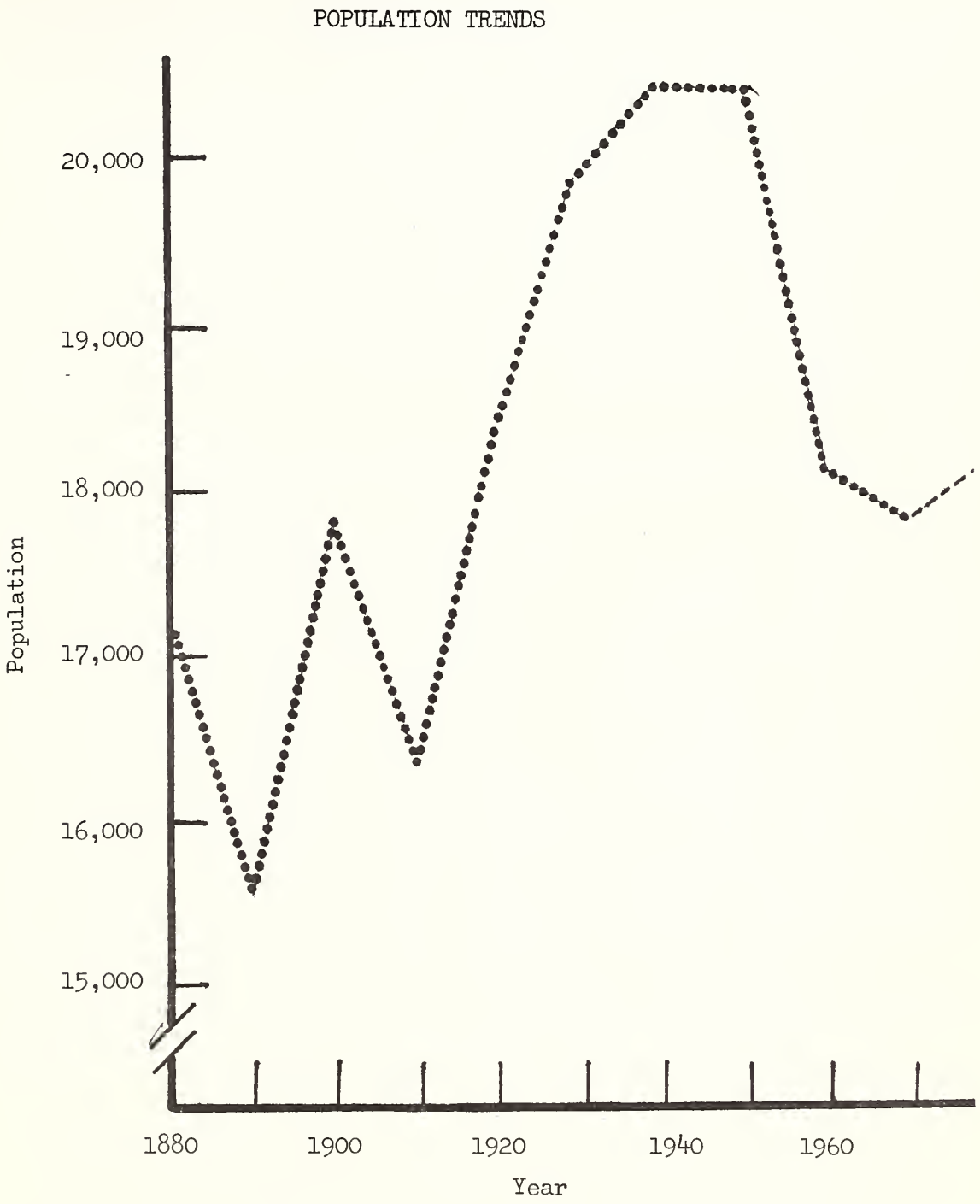
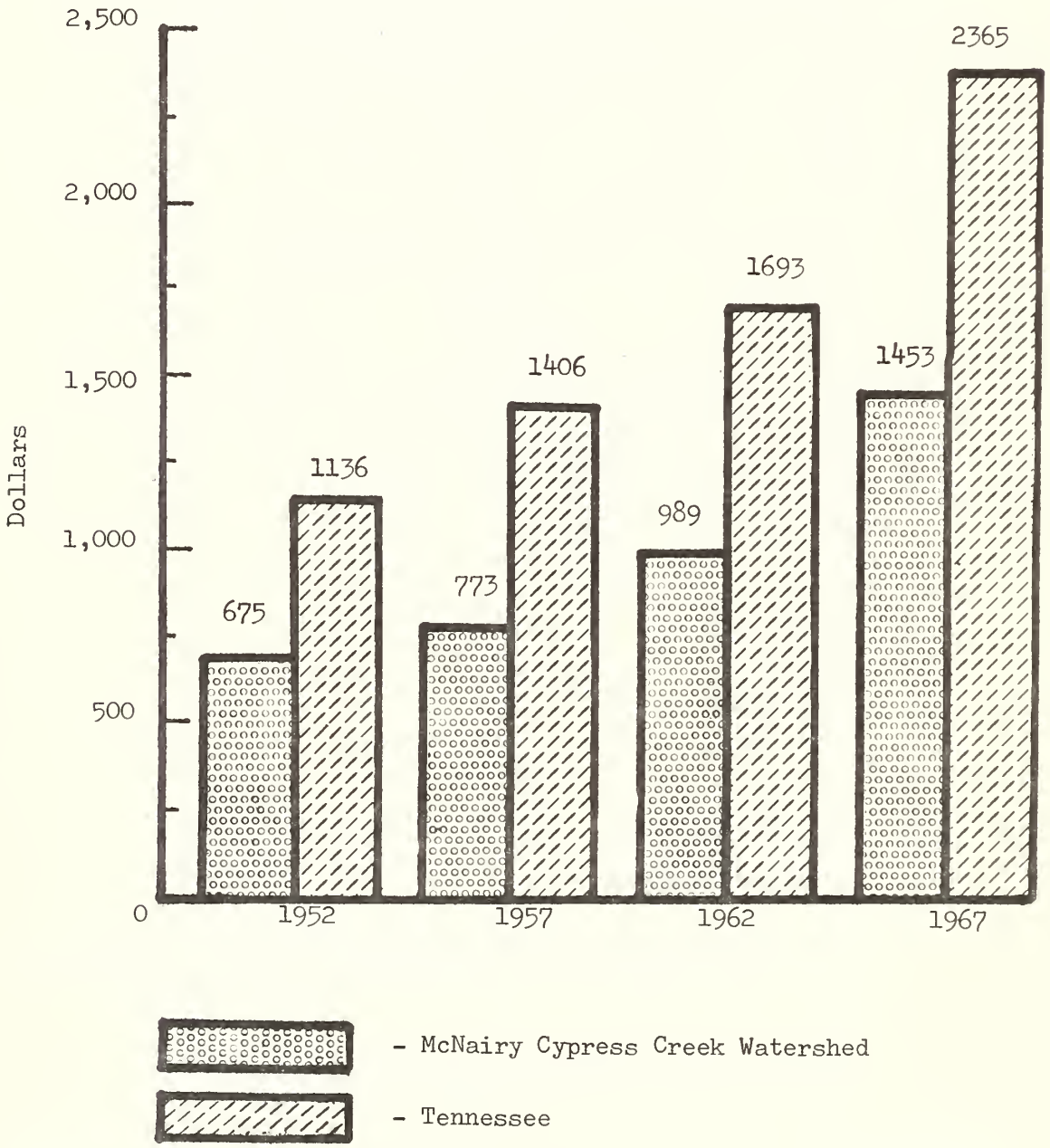
The population of McNairy County has varied tremendously since 1880. U. S. Census data indicates population instability.



The potential for development of the many assets of the watershed and surrounding area is high. In reviewing the assets for possible development, the people appear to have the greatest potential. The labor force

is almost all native born, and the educational level is climbing near the 12th grade. Workers are readily trainable and exceptionally eager to learn.

The average comparative per capita personal income is shown in the following graph for the watershed and Tennessee.



Source: Tennessee Department of Employment Security Research and Statistics.

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Fish and Wildlife Resource Data

Stream fishery resources, as a result of previous channel modification, are low to negligible in value and are confined to the lower half of the main stem of Cypress Creek. At present, the city of Selmer releases sewage with primary treatment into Cypress Creek. While sewage with only primary treatment could be detrimental to stream fishery, it does not appear to be detrimental here. Intermittent flow in the stream with high sediment loads are greater contributing factors to the low fishery value. Stream fishing pressure is low. Three impounded areas in the extreme lower reach of the watershed contain relatively high value sport fisheries. Two of these areas, Howell Pond and Baldwin Pond, are old creek channels closed off by past channel modification. The third, Big Hill Pond, was formed by construction of the Southern Railway across the lower end of the watershed. These areas are open to the public on a fee basis and fishing pressure is rather high for largemouth bass, bluegill, redear sunfish, warmouth bass, crappie, catfish, and other sunfishes.

Farm ponds are also utilized for sport fishing. Of the 450 man-made ponds in the watershed, about 150 are being managed to some degree for fish production. About 50 of the ponds are over one acre in size. The farm ponds in the area are generally stocked with largemouth bass, bluegill, and channel catfish.

Waterfowl use of the entire watershed is low to moderate but rather high in the extreme lower reach of the flood plain area. Woodland in this area floods for long periods during the late fall and winter months and provides good habitat for ducks. Acorns and other natural foods are available to ducks when the woodland is flooded. These wooded areas are generally found on soils that are poorly drained and frequently flooded. Water impounded in old creek channels provides resting and roosting areas for waterfowl.

Rabbit, squirrel, quail, and dove populations are moderate in abundance and the hunting pressure is also moderate. White-tailed deer are present in low to moderate numbers in the Big Hill Pond area. A hunting season for deer was started in 1959, and hunting effort is moderately high. Raccoon and furbearer population and harvesting pressure are moderate to high.

Recreational Resources

Recreation in this area is limited to hunting and fishing opportunities but little development or management is done to enhance these resources. The Tennessee Department of Conservation and Tennessee Game and Fish Commission agencies have plans for a large state park

in the watershed and also have announced plans for the Big Hill Pond State Park and Management Area but no action in the past three years has been taken. The potential for extensive development of hunting and fishing exists. Hunting and fishing opportunities are found on private land but are generally available only to local residents.

Archeological and Historic Values

This plan has been coordinated with the Tennessee Historical Commission and the National Register of Historic Places. There are no known archeological, historical, scientific or scenic values in the watershed that will be affected.

Soil, Water, and Plant Management Status

All land in the watershed is in the McNairy County and Northeast Mississippi Soil Conservation Districts. The two Soil Conservation Districts have assisted landowners and farmers in planning and establishing soil and water conserving practices. There are 400 soil and water conservation district cooperators whose farms contain 50,000 acres. Conservation plans have been prepared on 140 of these farms covering 20,000 acres. In the 10-year period from 1960-1970, conservation measures were applied in the watershed with district assistance at a total estimated cost of $724,300, Table 1A.

There are no forest lands administered by the U. S. Forest Service. The Tennessee Division of Forestry, in cooperation with the U. S. Forest Service through the various federal-state cooperative forestry programs, is providing forest management assistance,forest fire prevention and suppression, distribution of planting stock, and forest pest control assistance to private landowners.

The hydrologic condition of the 65,300 acres in forest is: very poor, 56 percent; poor, 28 percent; and fair, 16 percent; with none of the forest land being classed as good and very good. Overgrazing, burning, overcutting, and past cultivation of lands which are now forested have contributed to this poor hydrologic condition. Improved management and protection will cause the forest stands to contribute considerably to the overall economy of the watershed.

There is no National Forest land in the watershed. The forest types are: pine, 6 percent; pine-hardwood, 6 percent; hardwood-pine, 18 percent; and hardwood, 70 percent. The principal species are red oak, post oak, hickory, white oak, dogwood, shortleaf pine, blackjack oak, sweetgum, black gum, red cedar, and loblolly pine.

Sawtimber volumes will average 608 board feet per acre of hardwood and 66 board feet per acre of pine. The average volume of pulpwood is 185 cubic feet per acre of hardwood and 30 cubic feet per acre of pine. Markets are good for both sawtimber and pulpwood.

The state fire loss index goal and the watershed protection goal is 0.25 percent. The average percent burn for the past 5 years on the woodlands of the watershed is 0.77 percent. The continued increase in

efficiency and effectiveness of fire control activities by the Tennessee Division of Forestry will keep pace with any increase in hazard and risk and the present percent burn figure should continue to improve.

Estimates indicate that about 25,000 acres of the watershed has a standard soil survey completed and available for use in conservation planning. Surveys have been made as needed on the area by soil scientists of the Soil Conservation Service starting in 1951. The soil survey mapping on aerial photographs show soil type, slope, degree of erosion, and land use.

About 30 percent of the needed land conservation treatment has been applied by landowners and operators. Cost-sharing assistance available under REAP and other programs has been utilized in applying the treatment measures.

The earliest channel improvement was done on Muddy Creek in 1911, followed by Cypress Creek improvement in 1915. The improvement work was accomplished under the authority of the Tennessee Drainage District Act of 1909. In 1947 and 1948, channel improvement was performed along 4.6 miles of Cypress Creek, by Corps of Engineers' forces and equipment, beginning at its confluence with the Tuscumbia River and progressing upstream. This work was authorized under Section 2 of the Flood Control Act of 1937, as amended. The lower Cypress Creek Drainage District No. 12 of McNairy County, Tennessee was the sponsoring local organization. Improvements consisted of excavation of a new channel for the first 0.52 mile and the removal of drift, debris and silt for the remaining 4.08 miles. Through the years, all of Cypress Creek and most of its tributaries have been modified. Most of this work was accomplished on an individual farm basis. Since widespread coordination of effort was lacking, it has not had a lasting effect on relieving the overall flood problem.

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WATER AND RELATED LAND RESOURCE PROBLEMS

Erosion from the upland began soon after the area was settled and the hills were cleared for crops. This lack of concern for conservation resulted in many areas of critical erosion which reduced stream channel capacities. Channel improvement in 1911 and 1915 indicates that sediment damage to flood plain lands and frequency of flooding had become severe by this time. The additional dredging work done by the Corps of Engineers in 1947-48 indicated that upland erosion and sediment production was still excessive. Since that time progress has been made in the installation of conservation measures, but the problems of erosion, sediment, and flooding have become so severe over the last 100 years that the efforts of individuals are not sufficient to overcome these problems. A unified community effort is needed.

The primary problems along Cypress Creek result from erosion of the uplands which causes deposition of silt and infertile sediment on the bottom lands, siltation of stream channels, and flood damage to urban areas and prime agricultural land during periods of high rainfall. The total average annual flood damage without project conditions is estimated to be $517,000. The average annual flood damage to crops and pasture values is $297,400; roads and bridges, $46,800; other agricultural, $12,400; sediment, $20,600; urban property, $77,500; and indirect, $62,400.

Public water-related recreational facilities are practically nonexistent in and adjacent to the watershed. There are a few small private lakes, or ponds and sloughs that provide some fishing. There is a need for the development of lakes and facilities to provide the local residents an opportunity for the enjoyment of their leisure time.

The present municipal water supply for Selmer is provided by a system of three wells. These wells are not adequate to support the anticipated needs for industry. It is the desire of the sponsors to have a readily available surface water supply for future industrial use. The esthetic value of this surface water supply is also attractive to industry personnel.

The rate of establishing land conservation treatment measures needs to be accelerated. The need for land use adjustments is evident. Idle and denuded areas need to be rejuvenated with income-producing vegetation. Row crops need to be shifted to the bottom lands or grown in uplands in combination with well planned systems of stripcropping, conservation cropping, or contour farming. Inflated prices for some row crops, especially soybeans, have restored a number of acres of marginal and submarginal lands to crop production. This inefficient use associated with poor economic conditions has resulted in many areas still needing to be stabilized.

Floodwater Damage

About 14,115 acres of bottom land are subject to flooding by water overflowing from Cypress Creek and its tributaries. Some portions of

the main bottom will begin flooding following a rainfall of 1.5 inches within 24 hours. Flooding from small or medium storms occurs on an average of about three or four times per year.

The largest storm in the past 20 years occurred April 29-30, 1963 (25-year frequency). This storm flooded about 13,280 acres of bottom land. The McNairy County Independent newspaper gave the following account of this flood in the May 3, 1963 issue:

> "Rainfall totaled 4.75", with 4.0" occurring in less than four hours from 8:00 to 12:00 a.m., in East Selmer on Monday, April 29, 1963. Other unofficial gages registered from 3.0 to 5.5" for the day. Highway and grounds of Selmer Elementary School just south of the main business district were covered by 6 inches of water.
>
> Damage to county roads, bridges, and other private and public property was considerable. A total of 27 bridges washed out and will take an estimated 30 days to replace and repair. A few homes and businesses, mainly in Selmer, were flooded and had to be abandoned. At least 50 percent of the corn and cotton had been planted with about 50 percent of this amount in the flood plain. Practically all of the cotton and almost half of the corn will have to be replanted. There is no way of estimating damage from severe scouring, drifts, and deep sand deposits on cropland."

The April 29-30, 1963 flood evaluated as a 25-year frequency created the highest monetary loss experienced during recent years. Damage was scattered throughout the area but was concentrated in the vicinity of Selmer. The recurrence of the flood would cause an estimated $464,000 damage to residential, commercial, and industrial property in the city of Selmer. The flood evaluated as a 100-year frequency flood was about 2 feet higher than the 1963 flood (25-year frequency). A flood of this size would cause an estimated $1.3 million damage to residential, commercial, and industrial property in the city of Selmer.

The flood damage to agricultural and other non-agricultural properties is not increased significantly by the higher stages of the 100-year flood. The frequent occurrence of spring floods delay preparation and planting of crops on the bottom lands. Farmers are forced to substitute a short-season or a replacement crop for a full-season variety. Floods that occur after normal planting time make it necessary to prepare a new seedbed before replanting. The results of replanting a crop are broken and uneven stands, higher production costs, and a decreased net farm income. Soybeans and pasture have replaced many acres of cotton and corn in the lower half of the watershed. Some areas of cropland have swamped out and become idle wasteland.

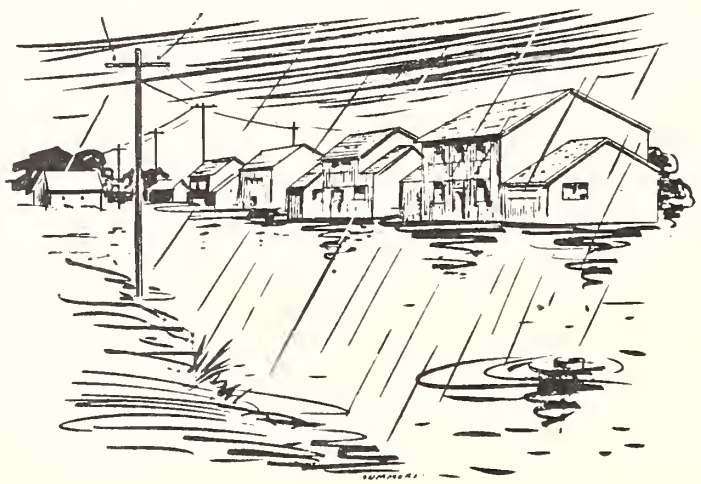
The landowners of the bottom lands report that average yields have been depressed by the frequent occurrence of floods. The following table shows the present land use distribution, acres, flood-free yields, and estimated percent yield losses in the flood plain:

Land Use	Percent Distribution	Acres	Flood-Free Yields	Estimated % Crop Loss
Cotton	12.6	1,778	865 Lbs.	21
Corn	28.6	4,033	82 Bu.	24
Soybeans	31.6	4,465	36 Bu.	26
Pastureland	12.6	1,777	5 AUM's	18
Forest land	10.4	1,465	-	-
Other	4.2	597	-	-
TOTAL	100.0	14,115	XXX	XXX

The present flood hazard has depressed the value of bottom land. Values, particularly in the flood plain, are difficult to assign because price and sale are often synonymous since there is a large-scale demand for land. The present value of bottom land as quoted by farmers ranges from $150 to $1,500 per acre. With flood reduction and sediment control, better land use and farming techniques can be employed. According to owners, future land values may range from $725 to more than $1,500 per acre. Present agricultural damage is estimated to be $297,400 annually on 12,470 acres.

Other agricultural damage within the flooded area consists of livestock losses, damage to fences, watergates, farm bridges, and damage to drainage systems by the accumulation of debris and sediment. The cost of repairing this damage is often higher than the complete replacement cost. This damage is estimated at $12,400 annually.

Damage to roads within the flood plain consists of siltation of drainage ditches, scouring shoulders, washing off gravel, washing away segments of earth fill, breaking up asphalt paving, and erosion of portions of the roadbed and fill beneath the surface. Bridge damage consists of loss of the bridge and/or damage to the abutments, piers, and approaches. These damages average $46,800 a year. Damage to residential, commercial, and industrial is $77,500 annually.



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Indirect Damage

Indirect damages are associated with the direct primary damages. The losses are less obvious but are just as real and their effects are felt long after a flood has subsided. Indirect damages that occur are a result of disruption of employment, loss of production during flood periods, interruption of the management and sale of products already manufactured, disruption of traffic, mail delivery, and school bus service, delay and inconvenience to the traveling public, and the interruption of the management, feeding, disease control program, and marketing of livestock and livestock products. Travelers going to and from work or school are endangered as cars and buses become isolated as bridges and roads are washed out.

A health hazard plagues the community of Selmer after each major flood. Floods larger than a 25-year frequency require the care and evacuation of many of the people in the flooded area. Sometimes electric power and telephone service may be disrupted causing inconvenience and costly repair. Food stored in refrigerators and freezers will spoil or become contaminated. Mental and physical fatigue will occur to flood victims giving rise to high blood pressure, heart condition, tension and fear of loss of life.

The flooding of the sewage treatment plant downstream from the GM&O Railroad is a health hazard and a source of stream pollution. During periods of overflow the sewage treatment plant becomes inoperative. Repair of the damage to (5 to 25 HP) motors from sediment and water is costly.

Erosion Damage

The continuous cultivation on the rolling and steep uplands, the lack of adequate cover on some of the grassland, and poor hydrologic condition of the woodland have contributed to the loss of top soil and sediment damages in the watershed. The relatively thin but fertile layers of silty loess top soil is underlain with less fertile Cretaceous sands and sandy clays. The inefficient use of this thin fertile layer of silty loess without adequate conservation measures has accelerated the loss of this important natural resource through erosion. The effect of this erosion has drastically reduced upland crop yields and caused soil deterioration. The following table gives estimates of the gross erosion for various conditions in the watershed:

	Tons/Acre/Year
Cultivated Land	9 to 17
Idle Land (Critical Area)	10 to 18
Pasture-Range	2 to 8
Forest Land	1.2 to 1.5
Gully	207
Streambank	210
Roadbank	210

Critical sediment source areas are shown on the problem location map.

The loess mantle is completely gone in many areas exposing the poorly productive and highly erosive Cretaceous sands. Vegetative recovery on these eroded sands is very slow and almost non-existent on many upland areas. The lack of adequate vegetation has increased the rainfall runoff and accelerated the rate of erosion.

Gullies have formed in the highly erosive sands as they become exposed and numerous areas have been abandoned to the forces of nature. Headward advancement of gully systems has taken many acres out of productive use. There are 4,960 acres of critical runoff and sediment producing gully areas. Records indicate that 6,950 acres of trees have been planted during recent years which have helped stabilize some formerly gullied areas.

The headward advancement and sloughing of 400 acres of critically eroding roadbanks undermine fences, remove land from productive use, and increase road maintenance.

The damage in the flood plain is caused by scouring or erosion during periods of overbank flow. The width and depth of the scour channels and the severity of the damage is related to the depth, velocity, duration, and type as well as the amount of ground cover at the time of flood flow. The effect of these scour channels has reduced the productive capacity of 185 acres of flood plain about 35 percent. Scour damage is evaluated with floodwater damage as an added production cost to the farmer for shaping and inconvenience.

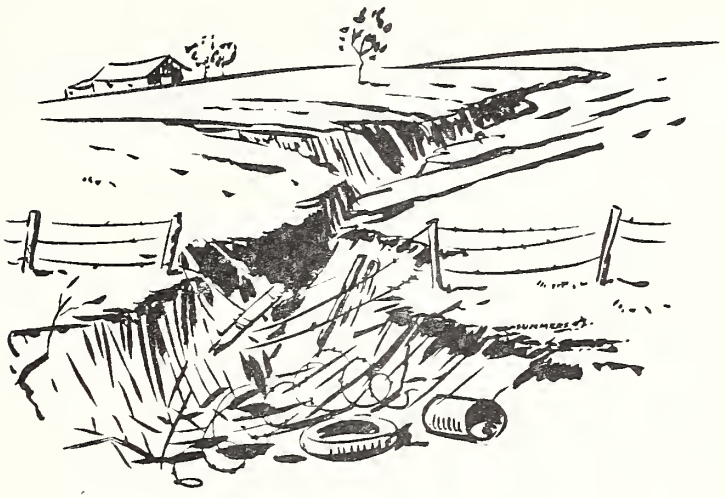
Sediment Damage

Infertile sandy Coastal Plain materials are washed from the upland with each rain and deposited on the fertile flood plains and/or in the main and tributary channels. Critical sediment producing gullies and roadbanks and sheet erosion are the major contributing sources.

The productive capacity of about 3,000 acres of crop and pasture land has been reduced an estimated 30 percent by overbank deposition of coarse-grained infertile sands. Sediment has been deposited on most of the forest land and dead timber stands are common in the swamped out area of the flood plain, especially downstream from Tennessee State Highway 57. Swamping has caused 240 acres of cropland to become idle since 1940. The sandy deposits are often deep and must be spread and worked into the underlying soil to avoid complete loss of productivity.

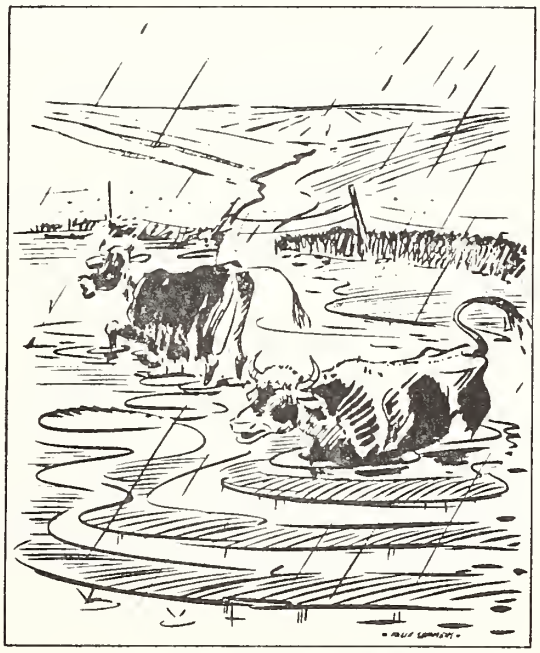
Deposition of bedload materials in main and tributary channels has reduced capacities and increased the frequency of flooding. This problem is not widespread but is concentrated in areas shown on the project map as needing channel excavation or enlargement. Spoil materials from previous channel cleanout and natural deposition have formed levees along the stream channels which impede the return flow of floodwater. The continued deposition of sediment in the channels and on the flood plain will increase the area and degree of damage to all of the flood plain lands.

On-farm drainage and road drainage ditches have become clogged with infertile sediment, reducing their capacities and requiring added maintenance cost to farm and county road systems.



Suspended sediment carried by flood flows is a major stream pollutant. The suspended soil particles reduce the quality of surface water within the watershed and also cause damages to downstream water resources and fishery habitat.

Present average annual sediment yield for the watershed is 87,036 tons. It is estimated that 80 percent or 69,629 tons of this yield is suspended sediment. The average annual suspended sediment concentration is estimated to be 288 parts per million. Average annual sediment damage is $20,600.



"No conservation - much sedimentation!"

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Flood in lower Cypress Creek on May 5, 1967 after cotton had been planted. It was necessary to plant soybeans in early June as a replacement crop.

Typical scour channel caused by floodwaters on Roland Creek.

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Agricultural land flooded on March 7, 1966. The crop residue must be removed or burned before the land is plowed.

This picture shows an attempt by a local farmer to turn land before removing drifts. These drifts must be removed before an adequate seedbed can be prepared. This land is located in the City Industrial Park in Selmer.

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Typical fence damage. Note how fence has been completely destroyed due to the collection of drifts.

Floodwaters on Roland Branch spilling over levee. This levee had to be rebuilt several times in the past few years.

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Gullied areas on upper Cypress Creek Watershed (Turkey Creek Branch). These areas are typical of the critical sediment producing areas shown on the Problem Location Map for this watershed.

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Typical roadbank sediment producing area.

Similar roadbank as shown above after being stabilized with kudzu crowns.

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A typical scene of floodwater damage to county roads within the watershed. Note gravel deposit in field at left.

This picture shows a county road in Lower Cypress beginning to flood. Frequently, during larger floods, school children are transported by boat or horseback across this section.

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Rampaging floodwaters crossing county road in Lower Cypress Creek Watershed (Indian Creek). Several truckloads of gravel are required annually to patch these washouts.

Drift collection on sewer and water pipelines on Crooked Creek above Federal Highway 45 just south of Selmer. During the April 1963 flood, floodwaters covered this road due to inadequate capacity under bridge.

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During the April 1963 flood, Selmer's football field and little league field were under floodwaters from Crooked Creek. Selmer's Elementary School is located in the background, and should the school ever have to expand, it will need to expand toward the flooded area. Under present conditions, the frequent flood problem presents a health and safety problem to the city of Selmer with respect to the elementary school children. With the project installed, flooding within this area will be greatly reduced.

This picture shows the city park in Selmer under water. Picnic tables are covered and only the tops of the garbage cans can be seen. Debris, silt, and sand deposits are left on top of tables, streets, etc., after each flood.

Drainage

Channels adequate for drainage requirements were provided on Cypress Creek and many of its tributaries through drainage districts, the Army Corps of Engineers, and the cooperation of local landowners. Some of these channels have become clogged with sand, silt, and debris. The reduction in channel capacity as a result of this deposition has increased the frequency of overbank flow and has resulted in the buildup of natural levees along the streambanks that impede the return of floodwaters into the dredged channels. Some of the soils in the flood plain have slow internal drainage and seldom have time to dry out sufficiently for tillage operations before overbank flow or runoff from adjacent hill land makes them wet again. This condition of frequent flooding makes it impractical to establish and maintain on-farm drainage.

Swamping of flood plain lands has caused 240 acres to become idle since 1940 and brush swamps have developed. In some areas timber has been killed due to year-round wet conditions.

Municipal and Industrial Water Supply

The present municipal water supply for Selmer is provided by a system of three wells but is not adequate to support the anticipated needs for industry. The three wells are the principal source of water for domestic and industrial use. Two of the wells have been in operation for many years and have a combined rated capacity of 700 GPM. In 1963, the needs of the community required drilling a third well which has a rated capacity of 1100 GPM.

The present population of Selmer is about 3,400 with an anticipated growth by the year 2000 to more than 7,000. Recently, the city of Selmer contracted with the newly incorporated East View community to supply about 500 new water users. Also, the city has contracted to supply water to two new industries. The present water requirements have been met but it is still evident that a need exists for the storage of water for future industrial use and the anticipated growth of Selmer.

The city of Ramer now has an adequate community water supply. The Economic Development Administration and Farmers Home Administration financed a deep well and a distribution system. The community's primary objective is to provide its population of 400 with an adequate and safe source of water. Another desire of the city is a sufficient supply of water to attract new industry and improve the employment opportunities of its citizens.

Recreation

There is a shortage of water-based recreational facilities and parks in Western Tennessee according to Department of Conservation Statewide Comprehensive Outdoor Recreation Plan. Public water-related recreational facilities are practically non-existent in and adjacent to the watershed. There are a few small private lakes or ponds and sloughs that provide some fishing.

The quality of fishing in oxbow lakes and sloughs is good. Some excellent bluegill fishing is found in this area. These are "swamp type" lakes and have good water quality. Farm ponds and the main stream have only fair to poor water quality due to high sediment concentrations. The size and number of these fishing areas are limited and are not sufficient to supply recreational needs.

Hunting opportunities for various game are present and utilized, but additional development for the future is needed.

The nearest recreational facility is Chickasaw State Park about 30 miles to the northwest. This park is a 11,200-acre wooded area catering primarily to picnicking, camping, and nature trails. Shiloh National Military Park is located about 15 miles southeast of Selmer. This park is a historic shrine commemorating the Battle of Shiloh during the Civil War. People from all sections of the United States are attracted to this area. TVA's Pickwick Dam and Lake is located about 20 miles southeast of Selmer near Shiloh Park.

Due to the shortage and overcrowded condition of the available recreational facilities in Western Tennessee, a need exists for new developments for local as well as regional use.

Fish and Wildlife

Farm game is in moderate abundance but the "clean till" farming and the increasing acreage of soybeans is damaging farm game habitat. High erosion rates as a result of these farming practices is also detrimental to water quality and fishery resources. Waterfowl habitat areas are being damaged by sediment deposition while other areas are becoming swamped. Erosion control measures and proper land use management would improve game and fish habitat. Future demands indicate a need for improved habitat management.

PROJECTS OF OTHER AGENCIES

There are no soon-to-be-constructed works of improvement (county, state, or federal) for water resource development which will affect or be affected by the works of improvement included in this plan.

The McNairy-Cypress Creek Watershed is located in the Hatchie River Basin and comes under the purview of the Corps of Engineers, Memphis District. The Corps of Engineers has been informed of the plans and progress made in this work plan development.

The United States Department of Agriculture has completed a survey of the Hatchie River Basin, with the Corps of Engineers. The Mississippi Board of Water Commissioners and the State of Tennessee co-sponsored the study. The study gave special attention to soil and water and related resource development opportunities to stimulate economic growth and enhance the welfare of the people of the basin.

The proposed works of improvement to be installed will constitute a needed and harmonious element in the overall development of the economic and water resources of the Tuscumbia and Hatchie River Basins. The measures for stabilizing critical sediment producing area and storage of sediment trapped in the pool areas of floodwater and multiple-purpose structures will reduce the amount of infertile sediment available to: (1) clog and reduce channel capacities downstream, (2) spread over the Tuscumbia and Hatchie River flood plains killing timber and crops, (3) require added channel maintenance costs, and (4) pollute and muddy the stream habitat of fish.

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PROJECT FORMULATION

The major considerations in formulating this project were the cause, amount and location of damage in the flood plain and needs for improvement. The sponsors and the Soil Conservation Service discussed the nature of these damages at meetings, including a public informational meeting in 1971, so there would be a common understanding of the type and degree of protection that might be expected from a flood prevention program.

Project formulation was based on the objectives agreed upon, which are:

(1) to accelerate the rate of establishing soil and water conservation measures until at least 62 percent of the land is adequately treated;

The inventory of land use and conservation treatment revealed that:

(a) the present watershed soil loss averaged about 9.7 tons/acre/year, which should be reduced;
(b) where adequate conservation treatment has been applied on the land the soil loss averages 4.2 tons/acre/year;
(c) the present soil loss from cropland ranges from 9 to 17 tons/acre/year, which is excessive;
(d) 4960 acres of critically eroding and high sediment producing areas needing stabilization is significant;
(e) 13,100 acres of cropland need conservation treatment;
(f) 3450 acres of pasture and hayland need improvement through proper management and renovation; and
(g) the land treatment program will result in a 58 percent reduction in gross erosion.

(2) to stabilize all critically eroding areas;
(3) to reduce annual crop and pasture damage about 75 percent;
(4) to meet the state fire loss index goal by continuing the increase in efficiency and effectiveness of fire control by the Tennessee Division of Forestry through the Cooperative Forest Fire Control Program;
(5) to minimize damage to roads and bridges and minor fixed improvements;
(6) to eliminate the damages along the fringe flood plain area in the urban area of Selmer from the 100-year frequency flood;
(7) to increase the recreational opportunities;
(8) to store water for future industrial use;
(9) to maintain, where possible, the present fish and wildlife resources; and

(10) to improve the environmental conditions of the watershed through critical area stabilization and farmland improvement under conservation management.

Land treatment measures were considered and agreed upon in project formulation on the basis that they will: (1) be effective in reducing erosion damage on existing cropland; (2) reduce runoff and sediment production that would adversely affect the operation and maintenance of the proposed works of improvement; (3) assure the realization of benefits used in justification of structural measures; and (4) increase the efficiency of land use.

In project formulation, a forest management program was developed from a field survey of the watershed and aimed at fulfilling watershed needs and objectives including: (1) manage forest lands to fulfill timber, wildlife, and recreation needs; (2) to maintain hardwood on hardwood sites, and encourage pine-hardwood mixtures on pine lands; and (3) maintain a balance between food-bearing, den, and potential timber trees.

Selection of the structural works of improvement was guided by the objectives of the sponsoring local organizations, physical characteristics of the watershed, and appropriate engineering criteria. The size and location of the floodwater-retarding structures were influenced by the level of protection needed to meet project goals; flood plain areas needing protection; and obstructions such as highways, county roads, farmsteads, and other developments.

Various alternative measures were studied in achieving the objectives of the Sponsors. These include:

(1) Present conditions of the watershed at the time of the study and the base to which the proposed project is added.

(2) Future With Changes in Land Use and Conservation Treatment Measures -
Land use changes and treatment measures were added to the first condition and evaluated based on the changes in the hydrologic soil cover complex (change in erosion and runoff). These measures will reduce average annual flood damage by about 10 percent.

(3) Future With Changes in Land Use, Conservation Treatment Measures and Combinations of Floodwater-Retarding Structures -
Seven combinations from 13 to 37 floodwater-retarding dams were added to the second condition to determine their effectiveness in reducing flood damages.

(4) Future With Changes in Land Use, Conservation Treatment Measures, Combinations of Floodwater-Retarding Structures and Channel Improvement -
Four alternate designs for channel improvement were added to various structure combinations in condition 3 after it was determined that floodwater-retarding structures alone would

not give the level of protection to meet project goals. Three methods of channel alteration were considered.

(5) Flood Plain Zoning and Floodproofing, Land Use and Conservation Treatment Measures -
Flood plain zoning, floodproofing were added to the land use and conservation treatment measures of condition 2 to determine their effectiveness in reducing flood damage.

One alternative to providing flood protection would be to purchase the flood plain land and convert the land use to grassland, forest land, and parks for public use. Purchase of the flood plain land presently in urban uses would be prohibitive due to the cost and would force families and businessmen to vacate their property which would be detrimental to the overall economy of the area. Existing agricultural land would continue to receive sediment and flood damage.

Floodproofing fixed improvements in the flood-prone areas was also considered. The cost of floodproofing would be high and there would be a continued threat of loss of life on streets and sidewalks, interruption of business and schools, and other damages which could not be effectively controlled by this method. Agricultural land throughout the flood plain would continue to receive sediment and flood damage.

Flood plain zoning would not provide protection of existing properties from flooding but will prevent future industrial, commercial, and residential expansion in the flood plain in Selmer. Flood plain zoning will be carried out by Selmer.

Forty-four floodwater-retarding structure sites were selected for evaluation. Seven combinations ranging from 13 to 37 floodwater-retarding structures with four alternate designs for stream channel improvement were studied. Channel improvement was included after it had been determined that the land treatment and combinations of floodwater-retarding structures would not provide an adequate level of flood protection. The major reasons for sites being dropped were fixed improvements, location of site in relation to flood plain areas needing protection, and the unfavorable relationship of benefits to costs resulting in some sites not being economically justified.

The potentials and possibilities for a recreational development in conjunction with one or more of the floodwater-retarding structures were discussed by the directors of the McNairy-Cypress Creek Watershed District and supervisors of the McNairy County Soil Conservation District in meetings with officials of McNairy County, city of Ramer, city of Selmer, and members of four civic organizations. After careful consideration of the need and opportunity, the officials of Selmer and Ramer expressed an interest in sponsoring recreational developments. Preliminary plans and cost estimates were developed in cooperation with these officials for recreational developments with basic facilities at structure sites no. 4 and 13.

The recreational development at site no. 4 will be about 1 mile north of Ramer and the development of site no. 13 will be about 2 miles

northeast of Selmer. More than a million people live within an 80-mile radius of these proposed developments. The level of recreational development in terms of design capacity on a Sunday during the heavy use season is 1,200 people. These include major activities as follows; 300 fishing, 150 boating, 430 picnicking, 150 camping, 160 hiking, and 180 other.

The city of Selmer indicated a need to store water in site no. 13 for future industrial use in conjunction with recreation. After consultation with private engineers representing the city, mutual agreement was reached to include water storage for future industrial use in this site. This site was selected for storage of industrial water based on its close proximity to the city, favorable geologic conditions, size of drainage area, anticipated future land use (95 percent woodland or grassland), water quality and estimated cost. Private engineers furnished the estimate of volume for water storage and the cost estimate of the water outlet structure. Future storage was correlated with a water budget study. The industrial water storage will be the last increment of the total permanent storage.

The city of Selmer considered additional wells as a source of water supply in lieu of additional storage in site 13. The city decided that surface water and its added esthetic value was desirable.

Due to the high initial cost, the city of Ramer chose not to include municipal water in any of the proposed floodwater-retarding structures but decided to drill a well to supply their present water demands.

In the final analysis of project formulation, the local sponsors agreed that 20 floodwater-retarding structures with channel improvement would meet their objectives. The sponsors and the Soil Conservation Service are in agreement that the structural program consisting of 20 floodwater-retarding structures and intermittent stream channel improvement is economically sound and feasible and is the best combination of those studied. In determining the overall structural program, consideration was given to incremental benefits, costs, degrees of protection, and displacement of people. The installation of the 20 proposed dams will not require the displacement of any person, business or farm operation.

The final project formulation was arrived at after several meetings of the sponsors and the Service. A draft plan was reviewed by the sponsors on March 13, 1970. A public information meeting was held in Selmer on April 22, 1971. Informational news releases were made in the Selmer paper both before (April 21, 1971) and after the meeting (April 29, 1971). Close coordination has been maintained among the sponsors, the county court, the county judge, the Farmers Home Administration, the city governments of Selmer and Ramer, the Tennessee Game and Fish Commission, the Fish and Wildlife Service, the Office of Urban and Federal Affairs, concerned individuals in the watershed area, and the Soil Conservation Service.

The land treatment and structural measures included in this plan were selected by the Sponsors since this combination is the most economical

alternative, economically sound, engineeringly feasible, and will provide a high level of protection.

A plan for flood control was developed in 1964 on Tuscumbia River under the authority of Public Law 566. The channel design of Tuscumbia River and Cypress Creek have been coordinated so that neither will create adverse conditions for the other. Neither channel is contingent on the other; however, the Tuscumbia River plan is scheduled for completion prior to the Cypress Creek plan. Measures are included in the Tuscumbia River Watershed Work Plan to provide a stable outlet for Cypress Creek. If Cypress Creek is constructed prior to Tuscumbia River, no measures are needed for stability of the channel outlet.

Since a reduction in flooding in the lower end of the watershed would adversely affect waterfowl and fishery habitat, measures were planned that would preserve important habitat areas and offset any losses which might occur. Six areas in the lower reach of the flood plain will be leveed and equipped with water-level control devices to maintain flooded conditions on at least 1,000 acres for waterfowl during the fall and winter. These areas are to remain in their present use most of which is woodland. The levees will divert Boles Branch into Baldwin Pond to offset fishery losses which could have resulted from decreased flooding by Cypress Creek.

In order to offset any loss of waterfowl habitat which could occur in the remainder of the flood plain, all single-purpose floodwater-retarding structures will be designed to permit seasonal fluctuation of the water level in the sediment pools for waterfowl habitat management.

Facilities will be provided for water-based recreation at the two multiple-purpose structures, and the reservoirs will be stocked and managed, insofar as practical, for fishing. The sediment pools of the remaining structures can also be stocked with fish.

Urban areas in Selmer still subject to flooding by the 100-year storm will be zoned and development restricted by the city.

Construction methods that will minimize disturbance and destruction of fish and wildlife habitat will be used during installation of the structural measures. As many trees as possible, particularly mast-bearing and large, beautiful trees, will be preserved during channel improvement and other construction operations.

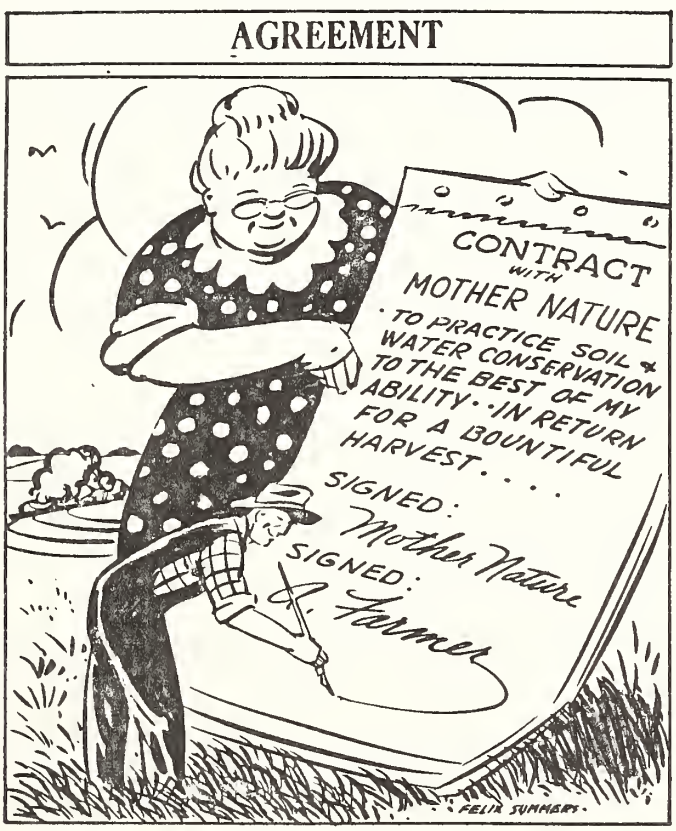
This plan has been coordinated with the Tennessee Historical Commission. Investigations by the Commission indicate that installation of the project will not encroach on any known archeological values, any historic place or any planning by the Commission for historic preservation.

WORKS OF IMPROVEMENT TO BE INSTALLED

The planned works of improvement to be installed are: (1) conservation treatment measures on 23,810 acres of land including 4,960 acres of critically eroding uplands and 400 acres of critically eroding roadbanks; (2) 18 floodwater-retarding structures and the improvement of about 31.19 miles of stream channel for flood prevention; (3) a multiple-purpose structure for flood prevention, industrial water supply, and recreation with basic recreational facilities for the city of Selmer; (4) a multiple-purpose structure for flood prevention and recreation with basic recreational facilities for the city of Ramer; and (5) measures that will mitigate damages to waterfowl and fishery habitat. Kinds of measures, quantities, and distribution of installation costs between P.L. 566 funds and Other funds for the total project are shown in Table 1.

Land Treatment Measures

Land treatment measures are considered one of the basic elements in a watershed project and are essential if it is to function successfully. The land treatment measures to be installed on 23,810 acres of land will improve the hydrologic condition, decrease runoff, erosion and sediment production, and assure the realization of benefits used in project justification. These planned land treatment measures will be installed at an estimated cost of $1,535,000.



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Conservation planning is a prerequisite to successful application of a soil and water conservation program. Technical assistance will be provided to landowners for planning and applying land use adjustments. The adjustments, together with conservation and management practices, will be worked out with the individual farmers and landowners in harmony with the overall land use and water management plan for the watershed. The resulting conservation plans will be in accordance with needs for sustained productive use of the land.

Soil surveys will be accomplished on all of the watershed by the end of the work plan installation period.

Alternative measures and land uses will be in keeping with standards used in obtaining effective soil and water conservation as outlined in the SCS Work Unit Technical Guide. Alternative land use and conservation measures that are necessary and justifiable for the conservation, development, protection, and improvement of the individual farms may be installed.

The conservation measures planned on 13,100 acres of cropland will consist of suitable combinations of conservation cropping systems, contour farming, stripcropping, grassed waterways, and diversions or surface field ditches, and row arrangements.

The treatment of 3,450 acres of grassland will consist of land use conversions and establishment on 1,750 acres of idle or cropland to permanent type pasture or hayland; and renovation of 1,700 acres of pasture and hayland. Other alternative combinations of measures to achieve adequate treatment such as grassed waterways, pasture and hayland management, drainage or diversions will be used. About 84 farm ponds will be constructed to complement pasture management.

Forest land treatment measures will consist of tree planting on 700 acres of idle or openland to improve watershed conditions by land use conversions; reforestation of 550 acres of understocked forest land to adjust land use within capabilities; and stand improvement measures on 500 acres of forest land to improve hydrologic conditions by manipulation of stand composition and density.

A forest management program aimed at fulfilling watershed needs and objectives will be followed. The forest lands will be managed to fulfill timber, wildlife, and recreation needs to the extent that such management is compatible with sound watershed management. The aim will be to maintain hardwood on hardwood sites and to encourage pine-hardwood mixtures on pine lands. A balance will be maintained between food-bearing and den trees, and potential timber trees.

The stabilization of critically eroding upland will consist of about 1,400 acres of vegetative planting of perennial grasses and legumes and about 3,560 acres of tree planting. The vegetative plantings will consist of the establishment of fescue, sericea, or any other suitable vegetation by seeding, mulching, fertilizing, liming, and proper management. The seeding will be done in conjunction with shaping and

preparation of an adequate seedbed with regular farm machinery and/or heavy equipment.

The tree planting will be loblolly pine or other soil stabilizing species. The area will be protected from fire and grazing will be controlled to insure success on this area needing heavy vegetative treatment.

Due to the severe nature of some of the critically eroding uplands, immediate steps need to be taken to limit the amount of sand and sediment escaping from these areas in the interval between treatment and effective stabilization with trees. This will necessitate the construction of about 250 debris basins to trap the sediment and to help control the runoff from these areas. All embankments, spillways, and other areas disturbed in construction of these basins will be stabilized with suitable vegetation.

About 400 acres or 134 linear miles of critically eroding roadbanks will be stabilized with suitable vegetation. The stabilization may consist of sloping, fertilizing, seeding, sprigging, and mulching of this major sediment producing area to suitable perennial grasses, shrubs, and legumes. The reason for stabilizing the roadbanks with vegetative cover is to reduce the erosion and sediment production thus reducing maintenance, improving the natural beauty, and reducing sediment pollution throughout the watershed.

The wildlife needs of food, cover, and water will be planned as a part of the land use and land treatment program in the watershed. Wildlife needs of food, cover, and water will be furnished in part by land use and conservation treatment measures already provided for in this plan. Individual landowners will also be given technical assistance in planning and carrying out practices that will enhance the supply of food and cover for wildlife on their farms. A timber management program which favors woodland wildlife habitat will be encouraged and recommended. Farm ponds can be important for fish production and the surrounding area will offer excellent habitat for field game. This also applies to floodwater retarding structures. Other practices which will improve food and cover conditions for wildlife include plantings of field borders and the establishment of cover conditions on stream banks, drainage ditches, fences, and other open areas. The conservation treatment measures used in stabilizing the critically eroding areas can further improve habitat for wildlife.

Technical assistance will be furnished to landowners in planning and carrying out practices that will enhance the supply of wildlife food and cover on the farms. A timber management program which favors woodland wildlife habitat will be encouraged and recommended. Wildlife habitat improvement will include the establishment and management of plantings for food and cover along field borders, stream banks, drainage ditches, fences, open areas, and wooded areas.

Structural Measures

The planned works of improvement to be installed are 18 single-purpose floodwater-retarding structures, a multiple-purpose floodwater-retarding, recreation structure with basic recreational facilities, a multiple-purpose floodwater-retarding, recreation and industrial water supply structure with basic recreational facilities; about 31.19 miles of stream channel improvement; and about 10 miles of levees along the channel and modification of risers of the principal spillway on single-purpose floodwater-retarding dams to preserve and replace waterfowl habitat. These measures will provide the degree of protection necessary to meet the sponsors' objectives. The total estimated cost of these measures is $5,433,000.

Beauty is created by God .. but its stewardship is vested in man.

The 18 floodwater-retarding structures and two multiple-purpose structures will detain 4.68 inches of runoff from 25 percent of the drainage area of the watershed above the Southern Railroad crossing near the watershed outlet. The total floodwater-retarding capacity in all structures is 10,325 acre-feet. The principal spillway and floodwater storage volumes are proportioned so emergency spillways will flow an average of only once each 100 years.

Provisions are made in all structures for the 100-year sediment storage. The crest of the low stage orifice in the principal spillway of the two-stage risers will be set at an elevation equivalent to the 100-year submerged sediment storage. The crest of the single-stage risers will be set at an elevation equivalent to the 100-year submerged sediment storage. A gated-orifice at an elevation equivalent to the 50-year submerged sediment storage will be added as an appurtenance to permit fluctuation of the water line to provide feeding, resting and roosting areas for migratory waterfowl. The crest of the principal spillway

of multiple-purpose structure No. 13 will be set at an elevation to store the 100-year submerged sediment and the beneficial water. The crest of the low-stage orifice in the principal spillway of multiple-purpose structure No. 4 will be set at an elevation to store the 100-year submerged sediment and the beneficial water.

The earth embankment of the dams will be built primarily from sandy silt and sandy clay materials. Principal spillways for the dams will consist of a reinforced concrete riser and pipe conduit with a metal slide headgate located near the bottom of the riser to facilitate lowering the water level for vector control and drainage of the reservoir, as needed. Foundation materials consist of sandy silts and clays. While these materials are of a yielding type, no foundation consolidation or shear problems are expected. Emergency spillways will be excavated in earth and vegetated.

The embankments, emergency spillways, and other areas within the easement areas that are disturbed during construction will be stabilized with suitable vegetation. The vegetative plantings will be established from fescue, bermuda grass, or any other suitable vegetation by seeding, mulching, fertilizing, liming, and proper management. The seeding will be done in conjunction with shaping and preparation of an adequate seedbed. These plantings will be fenced as needed to protect from overgrazing and to insure proper maintenance.

Installation of the floodwater-retarding structures will require the removal of one barn and the modification or relocation of three bridges, about 2,400 feet of paved road, and about 4,600 feet of gravel road. Roads and bridges are to be raised, relocated, or modified as agreed to by the sponsors and the agency having jurisdiction over the roads.

The surface area of the multiple-purpose recreation pool at site No. 4 is 52 acres. The total storage is 764 acre-feet, consisting of 95 acre-feet of sediment, 199 acre-feet of water for recreation, and 470 acre-feet of floodwater detention. This multiple-purpose structure and recreational area will require the purchase of about 144 acres of land in fee simple title and flowage easements on 36 acres. The sponsors will acquire about 116 acres in fee title for the recreation pool, flood pool, and access area to the entire recreation pool. Basic recreational facilities will be installed on 28 acres in two tracts adjacent to the reservoir.

The basic facilities to be installed on the 28-acre recreational area will include campsites, picnic areas, roads, parking, boat ramp, sanitary facilities, water and lighting utilities, shelter, landscaping, and fencing.

The surface area of the pool designated for recreation at multiple-purpose site No. 13 is 175 acres. The total storage is 4,046 acre-feet consisting of 775 acre-feet of sediment, 1,214 acre-feet of water for recreation, 1,214 acre-feet of water for future industrial use and 843 acre-feet of floodwater detention. This multiple-purpose structure and recreational area will require the purchase of about 428 acres of land in fee simple title and 8 acres of flowage easements. The sponsors will

acquire about 372 acres in fee title for the recreation pool, flood pool, and access area to the entire recreation pool. The industrial water supply pool will require the purchase of an additional 56 acres. Basic recreational facilities will be installed on 28 acres of land adjacent to the reservoir.

The basic facilities to be installed on the 28-acre recreational area will include campsites, picnic areas, roads, parking, boat ramp, sanitary facilities, water and lighting utilities, shelter, landscaping, and fencing.

Improvement of about 31.19 miles of stream channel is planned on Cypress Creek and its tributaries consisting of about 4.79 miles of cleanout and about 26.4 miles of clearing and snagging. Most of the main stem has been modified from time to time. The location of the planned channel improvement is shown on the project map.

The channel cleanout planned for the lower 4.79-mile segment of Cypress Creek will be confined to removal of sand deposits and drifts that tend to clog the lower end of Cypress Creek. This portion of Cypress Creek was cleaned out in 1947; however, the channel has gradually become clogged since that time by sand deposits brought in by floodwater. Critically eroding areas in the past as well as the present 5,360 acres of gullies and denuded roadbanks are major sources of sediment in the watershed. As the sediment from gullies and roadbanks as well as cropland sheet erosion is transported through the system of streams by floodwater, some of the heavier particles drop out and eventually clog the channels. The material that has been deposited in Cypress Creek is primarily a medium-grained sand of rather uniform particle size.

The method for removal of this non-cohesive and infertile sand material will be sand pumping. About seven locations will be required for sand pumping stations and four for disposal areas. The exact location and number of pumping stations and disposal areas will depend upon the condition of the channel at the time of final design. This is due to the movement of the sand in the channel. A total of 32 acres of cleared land will be needed for disposal of the estimated 200,000 cubic yards of sand. Final location of areas to be used for spoil banks will be influenced by the natural conditions in order to minimize detrimental effects on wildlife habitat. Sufficient topsoil will be removed prior to spoiling to cover the disposed material. Vegetation favoring wildlife habitat will be established on the disposal areas. Before and during sand pumping operations all visible as well as buried logs, stumps, trees, and other debris which the sand pump cannot handle will be removed and disposed of. An access road along the channel berm will be cleared in order that heavy equipment can remove this debris as well as trees which are in danger of falling in the channel. This access road will also be used for future maintenance operations.

The main function of the channel for which cleanout is planned is to provide an outlet for Cypress Creek rather than carry a specified peak flood flow. Channel bank stability is not expected to be a problem since the channel banks are presently well vegetated and stable and will be left undisturbed when possible. Studies of the channel bank

materials indicate that the top 3 feet is comprised of low plasticity silts and sandy silts. However, at depths of 3 to 8 feet, the logs showed moderately plastic clays. This material is erosion resistant and can safely withstand the maximum design velocity of 4.22 feet per second.

The clearing and snagging planned includes removal of drifts, brush, and trees within the wetted perimeter. A cross-sectional area sufficient to carry the required discharge will be maintained where clearing and snagging is planned. Sand pumping may be required to provide an outlet for several tributaries on which clearing and snagging is planned. This removal will be restricted to cleanout in areas that have become clogged with sediment and other debris. The specific location of the sediment bars will be made by field inspection prior to final design in order that final plans will accurately reflect the work to be done.

The required channel capacity through Selmer is based on control elevations for the 100-year flood to eliminate the major portion of the flood damage. The low-lying area along the creeks will still flood as indicated on the urban flood plain map of Selmer. Proper flood plain zoning will be implemented in this low-lying area by the city of Selmer. The elevation of the 100-year flood with project installed is about 3.5 feet above normal valley elevation. The hydraulic grade line elevations for the required discharges shown in Table 3A are equal to normal valley elevations.

Spoil material from channel cleanout will either be shaped into levees for waterfowl habitat preservation, maintenance roads, stacked adjacent to the channel or spoiled in selected leveed areas along the channel. Vegetation will be established as needed on stream channel banks, spoil banks, and other areas disturbed during the construction of the channel. All plantings will be protected from overgrazing and will be of a type beneficial to wildlife.

Pipe drop structures, excavated inlets, or other suitable grade control structures will be provided as needed for existing field drains, minor tributaries, and road drains. An estimated 100 pipe drop structures will be required. These structures will be used also where feasible to provide crossings for channel maintenance roads.

Existing bridges and culverts are adequate to provide channel capacity except the bridge located on the first gravel road crossing Cypress Creek upstream from Tuscumbia River. A new bridge will be required to replace the existing structure. This bridge will be installed by the Sponsors. The land rights and construction costs are included in the plan.

The 18 single-purpose flood prevention dams, a multiple-purpose flood prevention and recreation dam with basic recreational facilities and a multiple-purpose flood prevention, recreation and industrial water supply dam with basic recreational facilities, will require about 2,321 acres of land rights for the construction area, reservoirs, borrow areas, and emergency spillway area. The excavation or enlargement of the stream channels will require about 35 acres of additional land for the new channel. The present land use and cover condition on this area is as follows:

Land Use and Cover Conditions	Acres
Cropland	998
Cotton	130
Corn	309
Soybeans	329
Rotational Hay & Pasture	152
Other Crops	80
Pastureland	201
Forest land	1,052
Other (includes channels)	105
TOTAL	2,356

Mitigating Measures

Measures to retain existing waterfowl and fishery habitat are planned as a part of this project. In areas where a reduction in quality of habitat may occur, measures are planned to reestablish comparable conditions.

All floodwater-retarding structures, except Nos. 4 and 13, are designed with a gated-orifice as an appurtenance to the principal spillway at an elevation equivalent to the 50-year submerged sediment storage. This gated-orifice will permit fluctuation of the water line to provide feeding, resting and roosting areas for migratory waterfowl. A normal summer pool will be maintained at an elevation equal to the 50-year submerged sediment volume and a normal winter pool can be maintained at an elevation equal to the 100-year submerged sediment volume.

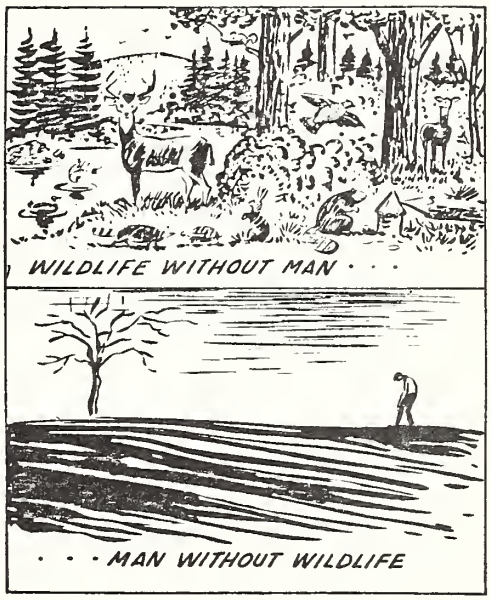
Shoreline deepening will be performed at the 50-year sediment storage elevation to conform to state vector control regulations.

The reservoirs of all structures will be stocked and managed, insofar as practical, for fishing. The two multiple-purpose reservoirs will be designed with this in mind.

A levee along the north and west sides of Cypress Creek will cause Boles Branch to outlet into Baldwin Pond. A water level control gate will be installed in the vicinity of Baldwin Pond to fluctuate the water level for mosquito control or other management purposes. The levee and water level control gate will offset fishery losses as a result of decreased flooding along Cypress Creek. Big Hill Pond will be unaffected by project works of improvement.

Measures to preserve waterfowl habitat include about 10 miles of levees and about 15 water level control gates. It will not be necessary to construct all of this 10 miles of levees. The old spoil banks and natural levee now in place will provide most of the levee needed for the mitigation measure. Six areas shown on the project map will be leveed by filling openings in the existing spoil banks and equipped with water level control devices to maintain about 1,000 acres in a flooded

condition during winter months. The water level control gates will permit draining wooded or cultivated areas during the growing season and permit draining wooded or cultivated areas during the growing season and permit mosquito control or other management practices. Two gates may be needed on some of the larger areas to facilitate de-watering in the spring. Depth of flooding in these areas will be consistent with conditions that are desirable for waterfowl feeding and resting.



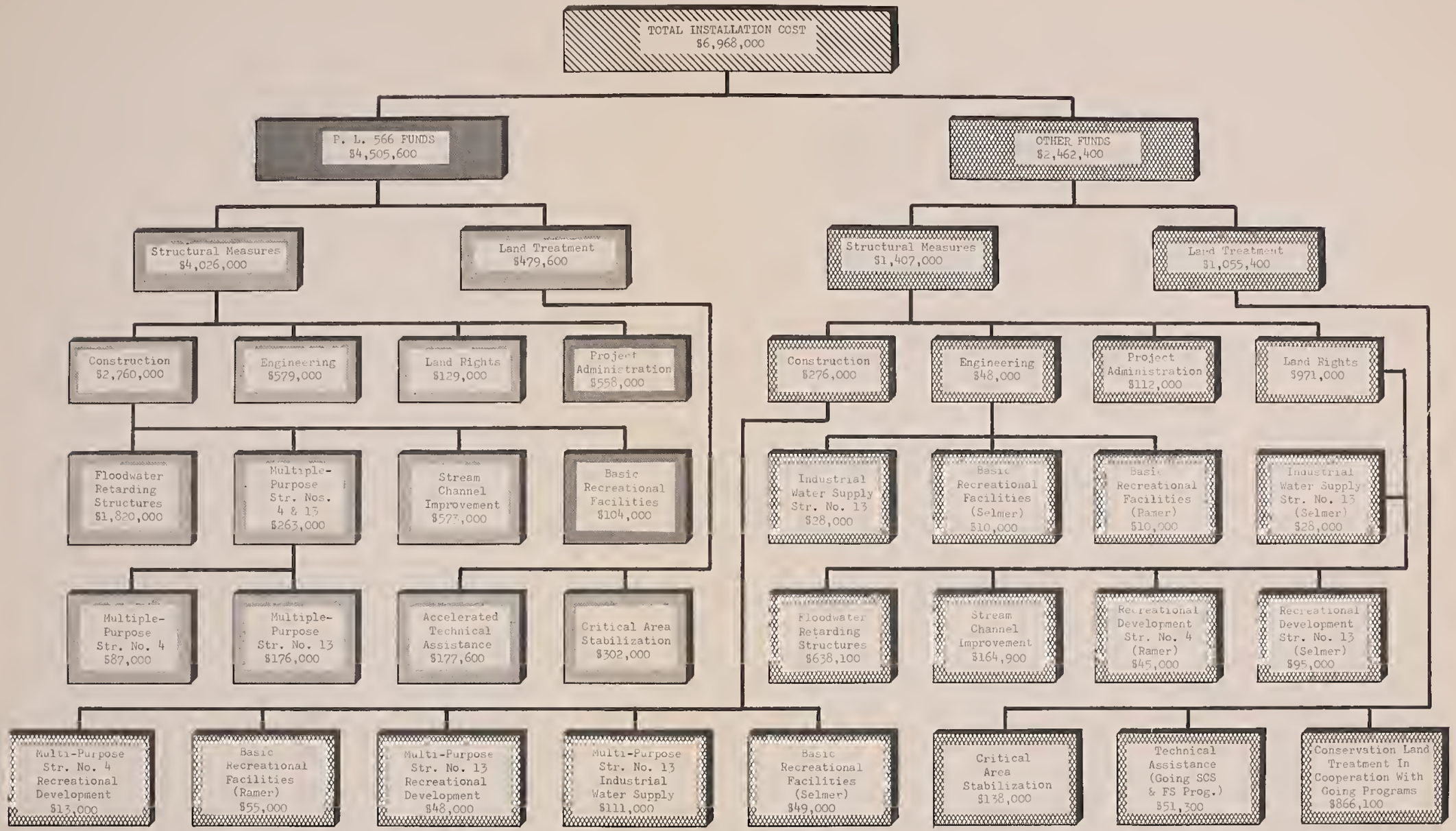
Additional areas, wherever spoil material is available and agreeable to the landowners, will be developed by shaping the excavated spoil material into levees to provide seasonal flooding of cropland for waterfowl usage. A detailed study will be made prior to preparing final plans and specifications for stream channel improvement and mitigating measures. All levees developed by shaping of the spoil material from channel excavation will be fertilized and sprigged or seeded with suitable vegetation. As many trees as possible, particularly mast-bearing and large, beautiful trees, will be preserved during channel excavation and snagging operations.

A wide range of measures will be used to control soil erosion, water, air and noise pollution. Some practices to control erosion are: leave native vegetation where possible (channels), temporary vegetation, diversions, waterways, pipe drops, silt basins, retaining dikes, sectional fills, sectional clearing, sectional excavation, pilot channels, orders of work, and control of the location of parking areas, work areas, and access roads. Measures for air pollution control will be: watering of access roads, work areas and borrow areas to control dust; proper emission control devices on equipment and burning control. Noise pollution will be controlled by proper equipment operation and maintenance.

If artifacts or other objects of historical or archeological value are discovered during construction, the proper state and federal agencies will be notified. Construction will cease until proper investigation of the "find" has been made and disposition made by the Secretary of the Interior.

EXPLANATION OF INSTALLATION COSTS

The total estimated installation cost of the project is $6,968,000, of which $4,505,600, or about 65 percent, will be P. L. 566 funds and $2,462,400, or about 35 percent, will be Other funds. The following chart illustrates the distribution of cost as outlined in table 1.



These estimates represent all of the direct and indirect cost items to install the project measures such as labor, materials, machinery, etc.

U. S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, NASHVILLE, TENNESSEE
USDA SCS FORT WORTH 556 1970

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Land Treatment Measures

The land treatment measures have an estimated installation cost of $1,535,000--Public Law 566 funds will furnish $479,600 and Other funds will furnish $1,055,400.

The distribution of the critical area land treatment costs follows:

Item	Estimated Cost	
	P.L. 566 Funds	Other Funds
Critical Area		
Vegetative	132,000	44,000
Roadside	56,000	56,000
Debris Basins	31,500	10,500
Tree Planting	82,500	27,500
Technical Assistance	43,600	0

The critical area vegetative planting, roadside stabilization, and debris basins will be installed by a division of work. The costs of technical assistance to be furnished from P.L. 566 funds by the Soil Conservation Service is $32,300 and the U. S. Forest Service is $11,300. This assistance will be provided for planning and applying the critical area treatment measures.

The forest land treatment program, except critical area tree planting, has an estimated installation cost of $102,300. The cost of technical assistance is estimated to be $6,300 of which $4,200 will be provided under P.L. 566; the U. S. Forest Service, by and through the Tennessee Division of Forestry, will provide $900; and the going Cooperative Forest Management Program will provide services valued at $1,200. The landowners and operators will furnish about $96,000 for installation of the measures.

All other land treatment has an estimated cost of $949,100; $819,300 will be Other funds and $129,800 will be P.L. 566 funds for accelerated technical assistance which includes about $31,500 for soil surveys and about $98,300 for the preparation and application of basic farm conservation plans.

It is expected that financial assistance will be used as available through the Rural Environmental Assistance Program or other going programs.

The goals for land treatment measures were based on field surveys and were adjusted to meet expected landowner participation. Installation costs were based on prices paid by landowners.

Technical assistance costs were based on the present cost of the going Soil Conservation Service and Cooperative Forest Management Programs.

Structural Measures

The estimated installation cost of the 18 single-purpose floodwater retarding structures for flood prevention and waterfowl mitigation is $2,864,500. The cost to be borne by P.L. 566 funds for construction and engineering services is $2,226,400. The estimated construction cost of $1,820,000 includes $20,000 for modification of risers on principal spillways and $195,100 for contingencies. Estimated cost for engineering services is $406,400, which includes the direct cost of engineers and other technicians for surveys, investigations, design, and preparation of plans and specifications for structural measures, including the vegetation. The cost of engineering services does not include similar services for acquisition of land rights. The installation cost to be borne by Other funds is estimated to be $638,100 for land rights. Included in the land rights costs are $48,000 for the relocation, modification, or alteration of three bridges, 2,400 feet of paved road, and 4,600 feet of gravel road and removal of a barn.

Joint costs for construction and engineering services for installation of multiple-purpose structure No. 4 are allocated 26 percent recreation and 74 percent flood prevention. The specific costs of land to be acquired in fee simple title are allocated 100 percent recreation, and flowage easements are allocated 100 percent flood prevention.

The Soil Conservation Service will provide from P.L. 566 funds for installation of multiple-purpose structure No. 4:

(1) 87 percent of total construction cost based on the "Use Facilities Method"; and
(2) 100 percent of all engineering services and 50 percent of the land rights for recreation.

Installation costs of basic recreation facilities were allocated to recreation. The Soil Conservation Service will provide 50 percent of the following items from P.L. 566 funds for installation of basic recreation facilities: construction, land rights, and A and E contract.

The city of Ramer will provide from Other funds for installation of multiple-purpose structure No. 4:

(1) 13 percent of total construction cost;
(2) 50 percent of the cost of land acquired in fee simple title for recreation; and
(3) 100 percent of the flowage easements for flood prevention.

The city of Ramer will provide 50 percent of the following items from Other funds for installation of basic recreational facilities: construction, land rights, and A and E contract.

The following table illustrates the allocation of cost to purposes and cost-sharing between P.L. 566 funds and Other funds for multiple-purpose structure No. 4 and basic recreational facilities.

COST-ALLOCATION AND COST-SHARING

McNairy-Cypress Creek Watershed, Tennessee

Item	Purpose						Total	Recapitulation	
	Flood Prevention			Recreation					
	P.L. 566 Funds	Other Funds	Total	P.L. 566 Funds	Other Funds	Total		P.L. 566 Funds	Other Funds
MULTIPLE-PURPOSE STRUCTURE NO. 4									
Joint Costs									
Construction	74,000	0	74,000	13,000	13,000	26,000	100,000	87,000	13,000
Engineering Services	18,500	0	18,500	6,500	0	6,500	25,000	25,000	0
Land Rights									
Fee Simple	0	0	0	29,000	29,000	58,000	58,000	29,000	29,000
Flowage Easements	0	9,000	9,000	0	0	0	9,000	0	9,000
Subtotal - Structure	92,500	9,000	101,500	48,500	42,000	90,500	192,000	141,000	51,000
BASIC RECREATION FACILITIES									
Construction	0	0	0	55,000	55,000	110,000	110,000	55,000	55,000
Engineering Services	0	0	0	10,000	10,000	20,000	20,000	10,000	10,000
Land Rights									
Fee Simple	0	0	0	7,000	7,000	14,000	14,000	7,000	7,000
Subtotal - Facilities	0	0	0	72,000	72,000	144,000	144,000	72,000	72,000
GRAND TOTAL	92,500	9,000	101,500	120,500	114,000	234,500	336,000	213,000	123,000

Joint costs for construction and engineering services for installation of multiple-purpose structure No. 13 are allocated 40 percent flood prevention, 30 percent recreation, and 30 percent industrial water supply. The specific costs of land to be acquired in fee simple title are allocated 86 percent recreation and 14 percent industrial water, flowage easements 100 percent flood prevention, and installation cost of water outlet structure 100 percent industrial water.

The Soil Conservation Service will provide from P.L. 566 funds for installation of multiple-purpose structure No. 13:

(1) 55 percent of total construction cost;
(2) 70 percent of total engineering services, or payments made for architectural and engineering services secured for surveys, investigations, design, and preparation of plans and specifications of the dam; and
(3) 43 percent of the cost of land acquired in fee simple title.

Installation costs of basic recreation facilities were allocated to recreation. The Soil Conservation Service will provide from P.L. 566 funds for installation of basic recreational facilities:

(1) 50 percent of the construction cost;
(2) 50 percent of the cost of land obtained in fee simple title; and
(3) 50 percent of the payments made for architectural and engineering services secured for surveys, investigations, design, and preparation of plans and specifications for basic recreation facilities.

The city of Selmer will provide from Other funds for installation of multiple-purpose structure No. 13:

(1) 45 percent of total construction cost of dam;
(2) 30 percent of total engineering services or payments made for architectural and engineering services secured for surveys, investigations, design, and preparation of plans and specifications for dam;
(3) 57 percent of the cost of land acquired in fee simple title
    (a) 50 percent of the cost of land acquired in fee simple title for recreation, and
    (b) 100 percent of the cost of land acquired in fee simple title for industrial water;
(4) 100 percent of the flowage easements for flood prevention;
(5) 100 percent of the specific costs for construction of water outlet structure; and
(6) 100 percent of the specific costs for engineering services of water outlet structure.

The city of Selmer will provide from Other funds for installation of basic recreational facilities:

(1) 50 percent of construction costs;

(2) 50 percent of the cost of land obtained in fee simple title; and
(3) 50 percent of the payments made for architectural and engineering services secured for surveys, investigations, design and preparation of plans and specifications for basic recreation facilities.

The following table illustrates the allocation of cost to purposes and cost-sharing between P. L. 566 funds and Other funds for multiple-purpose structure No. 13 and basic recreational facilities.

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COST-ALLOCATION AND COST-SHARING

McNairy-Cypress Creek Watershed, Tennessee

Item	Purpose							Total	Recapitulation	
	Flood Prevention			Recreation			Industrial Water Supply		P.L. 566 Funds	Other Funds
	P.L. 566 Funds	Other Funds	Total	P.L. 566 Funds	Other Funds	Total				
MULTIPLE-PURPOSE STRUCTURE NO. 13										
Joint Cost (Dam)										
Construction	128,000	0	128,000	48,000	48,000	96,000	96,000	320,000	176,000	144,000
Engineering Services	32,000	0	32,000	24,000	0	24,000	24,000	80,000	56,000	24,000
Land Rights										
Fee Simple	0	0	0	86,000	86,000	172,000	28,000	200,000	86,000	114,000
Flowage Easements	0	2,000	2,000	0	0	0	0	2,000	0	2,000
Specific Costs (Wtr. Outlet Str.)										
Construction	0	0	0	0	0	0	15,000	15,000	0	15,000
Engineering Services	0	0	0	0	0	0	4,000	4,000	0	4,000
Subtotal - Structure	160,000	2,000	162,000	158,000	134,000	292,000	167,000	621,000	318,000	303,000
RECREATIONAL FACILITIES										
Construction	0	0	0	49,000	49,000	98,000	0	98,000	49,000	49,000
Engineering Services	0	0	0	10,000	10,000	20,000	0	20,000	10,000	10,000
Land Rights										
Fee Simple	0	0	0	7,000	7,000	14,000	0	14,000	7,000	7,000
Subtotal - Facilities	0	0	0	66,000	66,000	132,000	0	132,000	66,000	66,000
GRAND TOTAL	160,000	2,000	162,000	224,000	200,000	424,000	167,000	753,000	384,000	369,000

The acquisition of land rights needed to construct the 18 single-purpose and 2 multiple-purpose dams will not require the displacement of any person, business, or farm operation as described in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970. The sponsors will provide all relocation assistance advisory services without P.L. 566 cost-sharing.

The estimated installation cost of the 31.19 miles of stream channel improvement and maintenance of waterfowl habitat is $809,500. The cost of mitigation is $3,000. The cost to be borne by P.L. 566 funds for construction and engineering services is $644,600. The estimated $573,000 construction cost includes $204,500 for excavation and $227,050 for clearing, $30,000 for pipe drop structures, $3,000 for water control structures, $5,000 for 20 miles of maintenance roads and $61,400 for contingencies. The cost of engineering services needed to install the stream channel improvement and measures to maintain waterfowl habitat is estimated to be $71,600. The estimated installation cost to be borne by Other funds is $164,900 for land rights. The estimated value of the land rights includes $6,000 for building a wooden bridge.

Waterfowl mitigation measures are to be installed with both the floodwater retarding structures and channel. The additional cost of mitigation is $23,000, which includes a gate on each principal spillway, and water control structures along the channel.

The Soil Conservation Service and the local sponsors will each bear the costs of project administration which it incurs, estimated to be $558,000 and $112,000 respectively. Project administration costs are considered a project cost but are not applicable to the individual project purposes served; therefore, they are not allocated to the individual measures. Project administration costs are those costs associated with administering the installation of structural measures. P.L. 566 funds will be used for reviewing engineering plans and for providing inspectors to insure that structural measures are installed in accordance with plans and specifications.

Other funds will be used to provide for contract administration, legal fees, court hearings, land acquisitions, and other general administration costs of the watershed district. The local sponsoring organizations will provide without P. L. 566 cost-sharing, the engineering, legal, and administrative costs incurred for acquiring land rights. The sponsors will, at their own option and without P.L. 566 cost-sharing, inspect the installation of any portion of works of improvement.

The following is an estimated schedule of funds for a 7-year project installation period and covers land treatment and structural measures. The schedule may be adjusted from year to year on the basis of any significant need and with consideration given to the project measures completed and appropriations actually made available by the Federal Government.

SCHEDULE OF ESTIMATED INSTALLATION COSTS
McNairy-Cypress Creek Watershed, Tennessee

Project Year	Estimated Cost (Dollars)				
	Land Treatment		Structural Measures		
	Non-Federal Land		Non-Federal Land		
	P.L. 566 Funds	Other Funds	P.L. 566 Funds	Other Funds	Total
First	184,300	72,900	90,500	14,000	361,700
Second	113,750	150,350	227,000	248,500 1/	739,600
Third	120,350	150,250	1,100,300	550,400	1,921,300
Fourth	21,500	113,700	734,500	164,200	1,033,900
Fifth	21,400	227,200	702,900	243,000	1,194,500
Sixth	10,000	227,300	589,800	175,900	1,003,000
Seventh	8,300	113,700	581,000	11,000	714,000
TOTAL	479,600	1,055,400	4,026,000	1,407,000	6,968,000

1/ An advance of $139,000 of P.L. 566 funds will be used to finance the local contribution for industrial water supply on a deferred repayment (P.L. 566, Sec. 2).

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EFFECTS OF WORKS OF IMPROVEMENT

The proposed works of improvement in the McNairy-Cypress Creek Watershed constitute a needed and harmonious element in the overall economic development program for McNairy County. The measures will directly benefit at least 28,300 acres of land consisting of 12,470 acres of flood plain and 15,830 acres of upland. The economic benefits used in project justification as well as the financial and technical assistance provided as a result of project installation will have a socio-economic impact on the community and surrounding area by improving, conserving, and utilizing the available natural and human resources.

The installation and development of this project will directly benefit thousands of people. Some of the people who will receive direct benefits are those that live, travel, seek employment, or trade within the watershed. It is estimated that at least 10,000 citizens now occupying or utilizing watershed facilities will be directly or indirectly benefited. About 60 percent of the 700 farms will receive direct benefits. The recreational developments and storage of water for industrial use will benefit all the residents of McNairy County and surrounding area.

The reduction in damage to roads, bridges, and other public property will make it possible for local units of government to divert funds that would otherwise have to be spent for repair and replacement of these facilities to better educational and health opportunities. Private funds used for repair of damage can be shifted to the amenities of life. Protection of the urban segments from a 100-year frequency flood will virtually eliminate having to evacuate the people from the flooded areas and having to care for the evacuees after removal.

The installation of proposed project measures will reduce damages as follows:

Type of Damage	Percent Damage Reduction
Crops and Pasture	64
Other Agricultural	81
Roads and Bridges	68
Residential, Commercial, and Industrial Property	95
Overbank Deposition of Sediment	85
Indirect	76
Sheet Erosion	17
Gully Erosion	69
Roadbank Erosion	65
Suspended Sediment Concentration	16

It is estimated that 12,470 acres of flood plain will be directly benefited by the installation of the project. The area inundated by the April 29-30, 1963 (25-year frequency) flood will be reduced about 25 percent. Flooding will be less frequent than once in three years on 75 percent of the flood plain upstream from valley section No. 26, which is about 3.5 miles above the outlet into the Tuscumbia River. The level of protection will be generally uniform throughout the rural areas.

After the project is installed, damage sustained by homes, commercial, and public properties in the flood plain of Cypress and Crooked Creeks at Selmer will almost be eliminated from a flood of the April 29-30, 1963 magnitude (25-year frequency). A 100-year frequency flood would be about 2 feet higher than the April 29-30, 1963 flood but the 100-year flood will be reduced about 4 feet by the project. The low-lying area along the creeks will still flood as indicated on the urban flood plain map of Selmer. Proper flood plain zoning will be recognized and enforced in this low-lying area.

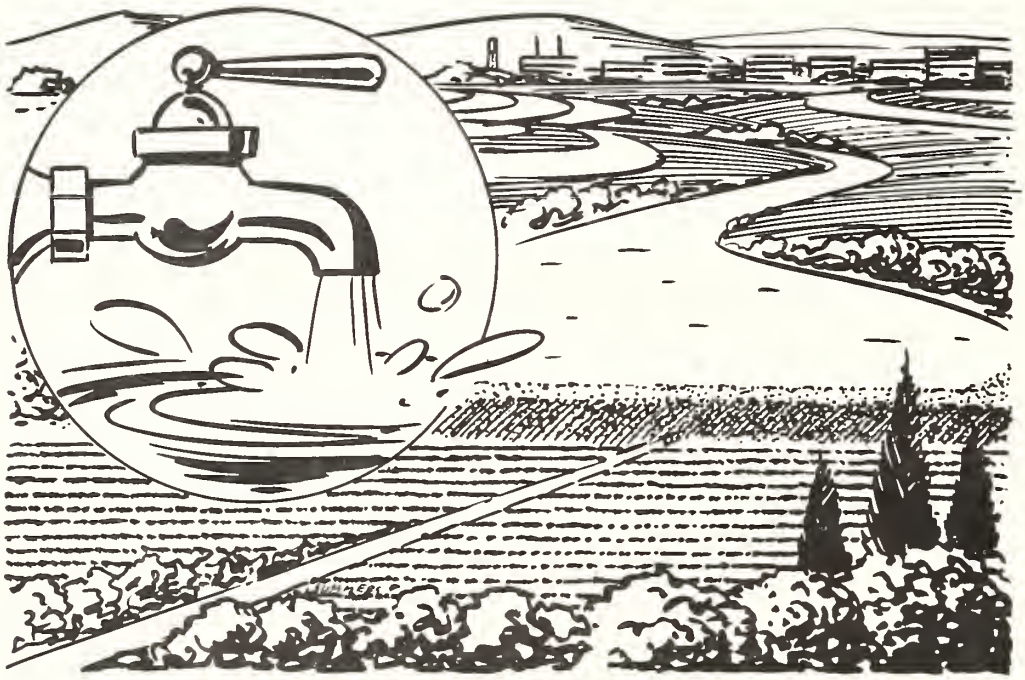
A higher degree of protection would require enlargement of railroad and highway bridges and is not economically justified. The sponsors plan to prevent development (both reconstruction and new) in the area subject to flooding by the 100-year event. This will be accomplished by zoning and publicizing the area subject to flooding by the 100-year event at least annually.

Reduction in the flood hazard will permit farmers to increase their levels of management. The protection afforded will stimulate farmers to fertilize more efficiently for higher crop yields, use improved varieties of seeds, select high income producing crops, and to be more proficient in the timing of their farming operations. Farm income will be enhanced due to a decrease in unit cost of production, an increase in mechanization, and an increase in efficiency when row crops are moved from the uplands to the flood plain. With reduced risk, more intensive land use becomes profitable both in terms of crop selection and levels of management.

With the project, future land use and yields in the flood plain area benefited is estimated to be:

Land Use	Percent Distribution	Acres	Yields
Cotton	11.8	1,474	860 lbs.
Corn	28.7	3,582	82 bu.
Soybeans	31.3	3,899	36 bu.
Pasture	13.1	1,633	5.0 AUM's
Woods	11.1	1,377	-
Misc.	4.0	505	-
Total	100.0	12,470	XXXX

Multiple-purpose structure Nos. 4 and 13 will have adequate water quality to meet state and local requirements for the planned recreational developments with industrial water also being included as a purpose in structure No. 13. The general public will benefit from enjoyment of their leisure time from increased opportunities afforded for recreation. The estimated annual visitor-days of use are: 20,000 fishing; 8,000 boating; 20,000 picnicking; 8,800 camping; 8,800 hiking; 4,800 hunting; and 9,600 other. The peak annual use will occur during the summer months within a 150-day period; however, use will be made of the developments throughout the entire year. The design capacity is estimated to be about 1,200 with an average annual use of about 80,000 visitor-days. Benefits for recreational purposes were estimated at $1.50 per user-day.



The water stored in structure No. 13 for industrial purposes will provide an adequate supply of water for the foreseeable needs for the city of Selmer. This water supply will benefit all the residents of the city and surrounding area and will make possible the expansion of industrial facilities and encourage new industries to establish in the locality. The benefits derived for this purpose were based on a delayed need of 10 years.

Cost-price relationships of existing development will require shifts in land use as values of new products are introduced with the desire for a higher standard of living.

Local secondary benefits will accrue in the watershed and the surrounding areas due to the installation of project measures. Goods and services produced as a result of the project will tend to stimulate local activity on a permanent basis. Products produced will require additional services from within the area. Profits will also be realized

from the sale of agricultural products by dealers and processors not directly benefited by the project. Expenditures for management inputs such as fertilizer, seed, machinery, and other needed materials will provide added profits to those who supply these materials and services.

Benefits will accrue due to the financial and technical assistance made available for the installation of the watershed project. The project will bring outside resources into the community and will provide an opportunity to use goods, services, and labor from the local area. The employment of unemployed or underemployed local labor will be needed during project installation and normal operation and maintenance of project measures will provide some continued employment.

The protection afforded by the project will permit land use adjustments of the flood plain and upland. Estimates indicate that there will be no increase in the total acreage of allotted crops within the watershed. Future land use is estimated to be:

Land Use	Acres	Percent
Cropland	25,200	23
Pastureland	8,400	8
Forest land	69,300	63
Other land	7,100	6
TOTAL	110,000	100

The application of conservation measures on 23,810 acres, which includes 7,980 acres of flood plain, is in the public and private interest. All lands within the watershed are eligible to receive assistance from conservation programs. The objective of individual farmers, especially those of low income, is to improve their socio-economic position by developing a long-range plan that will result in the highest net family income. Conservation plans will be guided by production alternatives that will provide the most productive use of land, labor, capital, and management. The application of conservation measures will provide more adequate cover, improve infiltration and physical conditions of the soil, contribute to the control of excessive runoff, reduce erosion and sediment production, increase income potential, and aid in maintaining the effectiveness of group facilities.

Benefits will accrue as a result of the stabilization of 5,360 acres of critically eroding uplands and roadbanks for which treatment is beyond the economic capabilities of individual farmers. These benefits will accrue to the national interest in continual preservation and beautification of natural resources, to the public interest as a reduction in net loss of agricultural potential that cannot be recovered by alternative means, and to the individual farmer as an increase in future net income. Benefits will also be recognized in reduced cost of construction, operation, and maintenance of the structural works of improvement.

With the installation of the planned project, flood plain farmers will no longer be plagued by frequent deposition of infertile sands on their bottom land soils. Channel improvement work will provide adequate outlets for on-farm drainage systems especially needed in the lower end of the watershed. Reductions in overbank deposition will allow farmers to better maintain their on-farm drainage systems and restore the once-cultivated, swamped-out areas to a more productive use.

Stabilization of critical runoff and sediment producing areas will not only reduce erosion and related off-site damages but will also greatly reduce the amount of land permanently lost to production due to the headward advancement of gully systems and roadbank erosion. Roadbank stabilization should significantly reduce maintenance costs to county roads and future erosion damages to roadside fences should be negligible.

The quality of the surface water resources will be greatly enhanced by the installation of the project. Suspended sediment has long been the major source of stream pollution, not only in the watershed but in downstream reaches of the Tuscumbia and Hatchie Rivers as well. The long-term average annual suspended sediment concentration at the outlet of Cypress Creek will be reduced by an estimated 16 percent. This is a significant reduction in terms of the volume of sediment leaving the watershed.

A complete soil and water conservation program will supply the food, cover, and water necessary to support many species of wildlife, and in return, the overall conservation program will benefit from the presence of wildlife. Land primarily used for cropland, pasture land, and woodland can produce wildlife as a by-product. Planned areas for wildlife habitat development on every farm will help make the farms efficient units for the production of both crops and wildlife. The construction of floodwater-retarding structures and farm ponds, stream bank vegetation, and the stabilization of critically eroding areas can all contribute to an increase in the amount of wildlife habitat. Proper use of the waterfowl mitigating measures will allow landowners to sell hunting privileges as a second source of farm income between normal farming operations.

Potentials for hunting and fishing will exist on and around the water impounded in the sediment pools of the single-purpose floodwater-retarding structures. The water quality of the structures should be adequate to support this expected recreational use since the structures will be maintained and operated in accordance with state health regulations regarding vegetation and vector control. Adequate sanitary facilities will be installed if recreational demands on these reservoirs indicate a need. Until adequate sanitary facilities are installed, the sponsors will discourage recreational use of the reservoirs.

The benefits to be derived from environmental improvements are highly variable, less tangible and more difficult to measure quantitatively than the physical damages. The project will preserve, enhance or create environmental conditions that are in harmony with national goals

for improvement of the resources of air, water, and land. The ecological conditions of the watershed will be greatly enhanced through stabilization of critically eroding uplands, farmland improvement under conservation management and construction of dams. The following factors will contribute to an environmental balance:

a. Reduce floodwater damage by 71 percent,
b. Reduce sediment damage to 12,470 acres of flood plain land by 85 percent,
c. Reduce upland sheet erosion by 17 percent,
d. Reduce gully erosion by 69 percent,
e. Reduce roadbank erosion by 65 percent,
f. Reduce suspended sediment concentration in Cypress Creek by 16 percent,
g. Eliminate stream pollution caused by flooding of the sewage treatment plant at Selmer,
h. Reduce indirect damages resulting from flooding by 76 percent,
i. Provide for the storage of 1,214 acre-feet of water for future industrial use,
j. Create two lakes for recreation with water surface areas of 52 and 175 acres with associated basic recreational facilities for use by the general public,
k. Create 1,010 surface acres of additional water that can be used for lake fishery,
l. Create 1,010 surface acres of water than can be used as resting area for migratory waterfowl with 220 of these acres managed to provide food for waterfowl,
m. Establish 100 acres of plantings that will provide food and cover for wildlife,
n. Improve wildlife habitat by the establishment of vegetative cover on 5,360 acres of critically eroding gullies and roadbanks in the watershed,
o. Create additional employment opportunities in this economically depressed area by providing 300 new jobs, and
p. Add to the beautification and esthetic values in the watershed for future generations.

About 2,265 acres of land will be needed for the construction of the floodwater-retarding and multi-purpose structures included in the project.

The sediment and multiple-purpose pools will inundate about 485 acres of cropland, 61 acres of grassland, and 464 acres of woodland. Agricultural use of this land and wildlife habitat provided by these areas will be lost. About 12.8 miles of stream channels will also be inundated. Fishery values provided by these intermittent low-base flow streams are negligible.

About 1,025 acres are in the retarding pool areas of the structures including 484 acres of cropland, 104 acres of grassland, and 437 acres of woodland. Use of these areas by wildlife and for agricultural production will be periodically interrupted by flooding.

Cover conditions and wildlife habitat will be temporarily disturbed on 60 acres of cropland, 35 acres of grassland, and 135 acres of woodland during construction of dams, spillways, and excavation of borrow materials. These areas will be revegetated with suitable grasses soon after construction, and controlled grazing of livestock will be allowed at the single-purpose structures.

Recreational facilities will be installed on 56 acres of land including 7 acres of grassland and 49 acres of woodland. These areas will be taken out of agricultural production and dedicated to recreational uses. Use of these areas by wildlife will be limited due to the installation of basic facilities and concentrated use of the areas by the general public.

Clearing and snagging along 26.4 miles of stream channels will temporarily disturb the wildlife habitat in these areas. As many trees as possible, particularly mast-bearing and large, beautiful trees, will be preserved for their wildlife and esthetic values. Suitable grass or other vegetation will be established and maintained for channel bank protection and wildlife usage. Clearing and snagging is not expected to significantly affect the low fishery values in the stream.

There are about 1,250 acres of woodland in the lower end of the watershed which remain flooded for long periods during the fall and winter months. These wooded areas provide good habitat for migratory waterfowl. Most of this land will remain in woods, but installation of the project would reduce the frequency and duration of flooding and make the area less attractive to waterfowl. Flooding also maintains the water level of the oxbow lakes in the lower end of the watershed. In order to mitigate possible losses of waterfowl and fishery habitat in the area, the plan provides for the construction and vegetation of 10 miles of levees with water level control gates for seasonal flooding of about 1,000 acres of flood plain land. These areas will be flooded during the fall and winter months for waterfowl use and drained during the spring and summer to maintain the growth of trees and other vegetation.

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PROJECT BENEFITS

The average annual benefits used in justification of the project are estimated to be $610,450, Table 6. The average annual flood damage without the project is estimated to be $517,100, and the estimated benefits from flood damage reduction are $372,100, Table 5. These benefits consist of reduction in damages as follows: crop and pasture, $191,800; other agricultural, $10,100; road and bridge, $31,800; residential and commercial property in Selmer, $73,500; sediment, $17,700; and indirect, $47,200.

The value of local secondary benefits that will accrue in the watershed and surrounding area due to project installation amounts to $51,600. The value of secondary benefits from a national viewpoint will accrue but were not considered in the economic evaluation or justification of this project.

The economic impact of project installation is considered pertinent and redevelopment benefits of $60,950 were evaluated and used in project justification. Benefits will accrue to the local economy from the values of local labor, services, and materials used during project installation. Provisions set forth for operation and maintenance will provide continuing benefits throughout project life but the impact on the local economy for the first 20 years was used.

It is estimated that annual benefits will accrue from the storage of a future industrial water supply in the amount of $30,800.

Estimated benefits of $120,000 will accrue to the two recreational developments. The evaluated recreational benefits are limited to 80,000 visitor-days of use which are expected to accrue from use by the general public and/or organized groups.

Research and experience have demonstrated that the combined public and private benefits derived from land treatment measures will more than exceed their cost of installation. Physical effects of the land treatment measures included in this plan were estimated but no specific determinations of monetary benefits were made for their economic justification. The $25,000 annual off-site benefits accruing as result of the installation of the conservation land treatment measures were not used in the justification of any other project measure.

COMPARISON OF BENEFITS AND COSTS

The estimated average annual cost to install, operate, and maintain the project structural measures is $352,727. The average annual benefits used in project justification are estimated to be $610,450. The benefit-cost ratio accruing as a result of total project benefits is 1.7 to 1.0, Table 6, and the benefit-cost ratio without secondary benefits is 1.6 to 1.0.

PROJECT INSTALLATION

Sponsors of the McNairy-Cypress Creek Watershed project plan to install the land treatment and structural measures within a 7-year schedule. Emphasis will be on critical area land treatment during the first 3 project years and the dams and channel will be built by construction units as shown in Table 7 during the last 5 project years. The actual sequence of construction will depend on: (1) meeting the requirements of at least 75 percent effective critical area stabilization; (2) agreements from not less than 50 percent of the owners and operators to carry out recommended soil and water conservation measures; and (3) order of obtaining land rights.

The anticipated plan for installation of project works of improvement is:

Project Year	Item
1	1. Install 50 percent of all critical area treatment. 2. Field survey work for dams 4, 13, 14, 15, 16, 17, and 18.
2	1. Install 12 percent of accelerated land treatment. 2. Install 25 percent of all critical area treatment. 3. Prepare designs and acquire land rights for dams 4, 13, 14, 15, 16, 17, and 18. 4. Field survey work for dams 9, 10, and 11.

Project Year	Item
3	1. Install 25 percent of all critical area treatment. 2. Install 12 percent of accelerated land treatment. 3. Construct dams 4, 13, 14, 15, 16, 17, and 18. 4. Prepare designs and acquire land rights for dams 9, 10, and 11. 5. Field survey work for dams 5, 6, 19, 23 and 25. 6. Field survey for channel design and mitigation measures. 7. Prepare design for channel and mitigation measures. 8. Acquire land rights for channel and mitigation measures.
4	1. Install 14 percent of accelerated land treatment. 2. Construct dams 9, 10, and 11. 3. Prepare designs and acquire land rights for dams 5, 6, 19, 23, and 25. 4. Field survey work for dams 28, 29, 30, 35, and 36. 5. Construct channels and mitigation measures. 1/
5	1. Construct dams 5, 6, 19, 23, and 25. 2. Prepare designs and acquire land rights for dams 28, 29, 30, 35, and 36. 3. Install 25 percent of accelerated land treatment. 4. Construct channels and mitigation measures.
6	1. Construct dams 28, 29, 30, 35, and 36. 2. Install 25 percent of accelerated land treatment. 3. Construct channels and mitigation measures.
7	1. Complete channel construction. 2. Install 12 percent of accelerated land treatment. 3. Final inspection of project measures and close project.

1/ Channel clean-out planned for the lower end of Cypress Creek will be done by sand pumping during a 4-year period.

Land treatment measures will be voluntarily planned and applied by the landowners in cooperation with the going and accelerated program of the McNairy County Soil Conservation District. The Soil Conservation Service will provide technical assistance for the preparation and application of conservation plans and will accelerate, from P.L. 566 funds, the technical assistance to the going district conservation programs.

The McNairy County Soil Conservation District will obtain agreements from landowners and operators to carry out conservation farm plans on not less than 50 percent of the land in the drainage area of each single-purpose floodwater or multiple-purpose structure. These agreements will be obtained before P.L. 566 funds are furnished to construct the dam.

The sponsors will encourage landowners to apply and maintain the forestry measures that will enhance woodland production through good watershed management. Improved protection from fire will be necessary on many areas for the success of watershed forestry measures. Trained personnel of the Tennessee Division of Forestry will advise and assist the sponsors in this matter. During the installation of the project, the going Cooperative Forest Management Program will be continued at its present level. An estimate of the state-federal matched funds to be used for this going program is included in the other cost of forestry technical assistance shown on Table 1.

The McNairy-Cypress Creek Watershed District will be responsible for installing those measures to stabilize or control high runoff and sediment producing critical areas. All critical area land treatment except tree planting will be installed by division of work. The district plans to perform their share of the installation work with contributed labor, equipment, and materials in lieu of providing cash.

The Soil Conservation Service will provide technical assistance to the McNairy-Cypress Creek Watershed District to apply the critical area vegetative, roadside plantings, and debris basins.

Funds from P.L. 566 to install the critical area vegetative plantings will be used to furnish, as needed, heavy equipment hire (such as bulldozers for shaping), and planting materials to include seed, fertilizer, lime (including spreading), and other similar materials (including delivery to central locations within the watershed). The watershed district will provide all other items required to prepare an adequate seedbed and to establish vegetation which includes, but is not limited to, labor, farm tractors, machinery, and transportation of materials within the watershed.

The funds from P.L. 566 for installation of critical roadside plantings will be used to furnish, as needed, materials to include bermuda grass sprigs, chunks, seed, fertilizer, lime (including spreading), and other suitable vegetative materials (including delivery to central locations within the watershed). The watershed district will furnish, as needed, equipment or equipment hire (bulldozers) for sloping road banks and all other items required to prepare an adequate seedbed and to

establish the vegetation which includes, but is not limited to labor, farm equipment, machinery, and transportation of materials within the watershed.

The ciritical area tree planting will be installed by the McNairy-Cypress Creek Watershed District. The district will enter into an agreement with the U. S. Forest Service to install the critical area tree planting on private land. This agreement will designate the responsibilities for installing the plantings. Methods agreeable to the sponsors and U. S. Forest Service will be used to accomplish the tree plantings. Site preparation and fencing will be used as needed to assure success of tree planting. The U. S. Forest Service will furnish technical assistance from P.L. 566 funds to apply the critical area tree plantings.

Prior to providing financial assistance from P.L. 566 funds for the construction of any planned structural measure, at least 75 percent of the effective land treatment measures must be installed or their installation commenced on those sediment source areas which, if left uncontrolled, would require a material increase in the cost of construction, operation, and maintenance of the structural works of improvement.

The McNairy-Cypress Creek Watershed District will install the single-purpose flood prevention measures. The district has sufficient legal authority to raise funds through assessments levied by the County Court and the power of eminent domain to acquire all land rights. This authority will be used as needed to insure the orderly progress in installing the planned works of improvement. The watershed district will obtain all needed land rights and will be responsible for the costs of engineering and legal services for acquisition of land rights for the single-purpose flood prevention measures.

The structural measures above Selmer will be contingent on Selmer enacting suitable regulations that will prevent new construction in the 100-year flood zone under project conditions.

The Soil Conservation Service will provide the engineering and technical assistance needed for design, preparation of specifications, inspection of construction, preparation of contract payment estimates, final inspection, letters of acceptance and related tasks for the establishment of all planned single-purpose works of improvement for flood prevention.

The city of Selmer will be responsible for installing multiple-purpose dam No. 13 and the basic recreational facilities. The city has sufficient legal authority--including raising of funds through taxation or assessments and the power of eminent doman--to acquire all land rights. This legal authority will be used as needed to insure the orderly progress in installing the planned measure. The city will obtain all needed land rights and be responsible for the costs of engineering and legal services for the acquisition.

The construction plans and specifications for multiple-purpose dam No. 13 and basic recreational facilities will be prepared by private engineers through negotiated A&E contracts. The A&E contracts will provide for surveys, investigations, design, and preparation of plans and specifications for construction of dam No. 13 and basic recreational facilities.

The city of Ramer will be responsible for installing multiple-purpose dam No. 4 and basic recreational facilities. The city has sufficient legal authority--including raising of funds through taxation or assessments and the power of eminent domain--to acquire all land rights. The legal authority will be used as needed to insure the orderly progress in installing the planned measure. The city will obtain all needed land rights and be responsible for the costs of engineering and legal services for acquisition.

The Soil Conservation Service will provide the engineering and technical assistance for design, preparation of specifications, inspection of construction, preparation of contract payment estimates, final inspection, execution of certificate of completion, and related tasks for establishment of planned multiple-purpose dam No. 4.

The construction plans and specifications for basic recreational facilities will be prepared by private engineers through a negotiated A&E contract. The A&E contract will provide for surveys, investigations, design, and preparation of plans and specifications for construction of basic recreational facilities at multiple-purpose dam No. 4.

The Soil Conservation Service will participate with the cities of Selmer and Ramer in the A&E contract negotiations. The Service will administer the A&E contract, inspect construction, prepare contract payment estimates, perform final inspection, letter of acceptance, and perform related tasks to insure that the measures are installed in accordance with plans and specifications.

The planned structural measures, except basic recreational facilities, will be installed by formal construction contracts as developed by competitive bids. The basic recreational facilities will be installed by performance of work. The cities of Selmer and Ramer plan to perform certain elements of the installation work with their own forces or with labor, equipment, and materials in lieu of providing cash, as a portion of their share of cost. The price for the work will be established by negotiations between the Service and the cities and will be included in the project agreement. The local sponsors plan to install roads, parking areas, campsite clearing, grading, and parking spurs, landscaping, and fencing. Public Law 566 funds will be used to install electrical, lighting, water and sanitary facilities, picnic facilities, grills, tables, shelter, and garbage can racks. Performance of work will conform to drawings and specifications prepared by an A&E contract. Alternative combinations of items of work may be performed when found to be appropriate during negotiations.

The watershed district and cities of Selmer and Ramer will administer their own contracts. They may, at a later date, request the Soil Conservation Service to administer the contracts. The sponsors will at their own option and without P.L. 566 cost-sharing inspect the installation of any portion of the works of improvement.

Roads, bridges, barns, and other fixed improvements involved in the floodwater-retarding structure sites and the stream channel improvement measures will be altered, modified, relocated, or replaced as agreed upon by the sponsoring local organizations, the local branch of government responsible for roads, and the Service. The sponsoring local organizations will be responsible for the disposition of these facilities and other land rights matters.

The sponsors will comply with the provisions contained in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646, 84 Stat. 1894) and the regulations issued by the Secretary of Agriculture pursuant thereto.

The sediment pools of the floodwater-retarding structures can be correctly stocked with fish. These fish can be obtained from federal, state, or private hatcheries. Technical assistance will be provided by the Soil Conservation Service in stocking and managing these pools for fish production. This stocking will be in accord with the current policies of the Tennessee Game and Fish Commission.

The construction of dams and recreational development will be installed to meet the requirements and regulations of the Tennessee Department of Public Health.

FINANCING PROJECT INSTALLATION

The McNairy-Cypress Creek Watershed District was authorized by a referendum on November 3, 1961, and was formed in accordance with the provisions of the Tennessee Watershed District Act of 1955, as amended. The district has completed its formal organization and has actively participated in the development of this watershed work plan. The major costs of organizing have already been incurred and were locally financed. The watershed district will bear all costs of court hearings, assessor fees, and other related administrative costs.

The land treatment measures will be voluntarily installed by the landowners and operators at their own expense. Cost-sharing assistance now available under the Rural Environmental Assistance Program or other going programs will be utilized in applying these measures. However, some measures may not be eligible for REAP assistance.

All critical area treatment, except critical area tree planting, will be installed using P.L. 566 funds and Other funds by divisions of work.

The critical area tree planting will be cost-shared 75 percent P.L. 566 funds and 25 percent Other funds. This is the maximum cost-sharing ratio for similar measures under the current Rural Environmental Assistance Program in Tennessee.

The McNairy-Cypress Creek Watershed District has initiated negotiations with the Farmers Home Administration by filing a letter of intent to finance their share of the project installation costs for land rights and project administration by utilizing the loan provisions of Section 8, P.L. 566, as amended. The district's cost is estimated to be $831,400. The district will repay its loan through an annual assessment levied by the county court. The assessment will be determined so as to meet the loan repayment needs and the annual operating expense of the district. In addition, a maintenance assessment will provide the funds needed to adequately maintain the works of improvement.

If the court levied an assessment on 12,470 acres of benefited land, the rate would exceed $4.00 per acre assuming the district must borrow all of the $831,400. This is not believed to be required since the sponsors expect to meet a portion of their cost through donations.

The incorporated city of Selmer will assume the financial responsibilities for the installation of multiple-purpose structure no. 13 and recreational development. The city will use two loans from Farmers Home Administration through the provisions of Section 2, P.L. 566, as amended, to finance their share of the project installation cost. One loan will have a deferred repayment to pay costs allocated to industrial water. The second loan is to install the recreational complex.

A letter of intent has been filed with FHA and tentative approval has been granted by the State Director to pay the estimated $139,000 cost allocated to industrial water supply for construction, engineering services, land rights, and project administration, to include the cost of installing the water outlet structure for release or withdrawal of stored water. The city will use the water supply as soon as the need arises but not later than 10 years after construction and will continue throughout the life of the structure. The city will execute an agreement for repayment of the advanced funds with FHA prior to signing the project agreement for engineering services provided by negotiated A&E contract, construction of dam No. 13, or purchase of land rights. The loan funds allocated to industrial water will be repaid with interest from their regular sources of revenue starting 1 year after water is first used or 11 years from completion of the structure, whichever is earlier. Repayment by the city of Selmer will be completed not later than 50 years from the completion date of the structure. The interest rate will be in accordance with Section 8, P.L. 566, as amended.

Selmer has initiated negotiations with FHA by filing a letter of intent to finance their share of cost allocated to flood prevention and recreation at structure site No. 13 for construction, engineering services, land rights, and project administration. The loan is estimated to be

$289,000. Facilities installed by performance of work agreements with the city's own forces or with contributed labor, equipment, and materials in lieu of providing cash will reduce the amount of the loan. The loan repayment with interest will be from their regular sources of revenue.

Ramer has initiated negotiations with the Farmers Home Administration by filing a letter of intent to finance their share of the costs by utilizing the loan provisions of Section 8, P.L. 566, as amended. The city of Ramer's cost for construction, engineering services, land rights and project administration is estimated to be $147,600. Facilities installed by performance of work agreements with the city's own forces or with contributed labor, equipment, and materials in lieu of providing cash will reduce the amount of the loan. The loan repayment with interest will be from their regular sources of revenue.

No land acquired for recreational developments with P.L. 566 financial or credit assistance will be sold or otherwise disposed of for the 100-year evaluated life of the project except to a public agency which will continue to maintain and operate the development in accordance with the operation and maintenance agreements. The lease of land for concessions will be permitted for essential purposes such as lunch stands, boat rentals, and other related concessionaire facilities.

Federal assistance for carrying out the works of improvement on non-federal land, as described in this work plan, will be provided under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress; 68 Stat. 666), as amended. This assistance is contingent on the appropriation of funds for this purpose and the sponsoring local organization meeting their prior obligations for land rights.

Federal financial assistance for application, construction, or A&E contract will be provided under appropriate agreements executed by the sponsors and the Soil Conservation Service. The agreements to be executed are:

(1) specific operation and maintenance agreements;
(2) engineering services agreement on multiple-purpose dam No. 13 and basic recreational facilities;
(3) land rights agreement on multiple-purpose dams No. 4 and 13 and basic recreational facilities; and
(4) project agreement on construction or installation.

PROVISIONS FOR OPERATION AND MAINTENANCE

The land treatment measures applied on the farms will be maintained by landowners and operators at their own expense under agreement with the McNairy County Soil Conservation District. Forestry technical assistance to operate and maintain the watershed forestry measures will be provided by the going Cooperative Forest Management Program. The needed forest fire protection will be continued by the existing Cooperative Forest Fire Control Program.

The McNairy-Cypress Creek Watershed District will be responsible for the maintenance of all critical area treatment. Most of the maintenance will be carried out by individual landowners.

The estimated annual cost of the maintenance for the critical area treatment is $25,000. The maintenance of these land treatment measures will include periodic application of fertilizer and lime, controlling obnoxious vegetation by mowing, protection from overgrazing, keeping adequate vegetation on spillways of debris basins, protection from fire, and other management techniques performed on similar practices of the individual farm operation. Maintenance not carried out by landowners will be performed by the watershed district.

The McNairy-Cypress Creek Watershed District will be responsible for adequately protecting, operating, and maintaining the single-purpose flood prevention structural works of improvement and mitigation measures. The district's estimated annual cost of operation and maintenance is $14,000, which includes $4,875 for the 18 single-purpose floodwater-retarding structures; $6,625 for stream channels; and $2,500 for fish and wildlife habitat to insure continued functioning with the project.

The watershed district will arrange with private landowners and operators to perform minor maintenance jobs in conjunction with their regular farming operations. It is estimated that over 43 percent of the regular operation and maintenance can be accomplished in this manner. Major maintenance tasks, estimated to cost $8,000 annually, will then be performed by the district in the manner most advantageous to them.

The city of Selmer will be responsible for adequately protecting, operating, and maintaining multiple-purpose structure No. 13 and recreational development at a total estimated cost of $16,000 annually. The annual operation and maintenance cost is estimated to be $1,000 for multiple-purpose dam No. 13 and $15,000 basic recreational facilities. An additional $5,000 has been included as a replacement fund for recreational facilities.

The surface of the beneficial water supply pool of multiple-purpose reservoir No. 13 is 230 acres at the crest of the principal spillway,

elevation 487.8 feet mean sea level. The 1,214 acre-feet of storage allocated to industrial water plus seepage and evaporation, will be operated between the top of the riser, elevation 487.8 feet MSL, and top of recreation pool, elevation 481.9 feet MSL. The city of Selmer will notify the Service when the reservoir is drawn below the top of the recreation pool, elevation 481.9 feet MSL. The city of Selmer and the Service will then determine if there is a continuing need to withdraw industrial water from the recreation pool. To continue using the recreation water for industrial purposes, Selmer will reimburse the Federal Government for all P.L. 566 funds used for the public recreation costs associated with the reservoir.

The city of Ramer will be responsible for adequately protecting, operating, and maintaining multiple-purpose dam No. 4 and the recreational development. The total annual operation and maintenance cost is estimated to be $12,500, which includes $500 for multiple-purpose dam No. 4 and $12,000 for the recreational development. Operation of the dam may include the fluctuation of the water level and management for fish production. An additional $5,000 was included as a replacement fund for recreational facilities.

The maintenance of single-purpose floodwater-retarding and multiple-purpose structures will include the application of measures to prevent deterioration and the repair of damages that may occur. The cost can usually be minimized by performing maintenance when it is first needed. The maintenance of structures will include, but may not necessarily be limited to, removal of debris from principal spillways, repair of fencing, keeping adequate vegetation on the dam and emergency spillway, restoring concrete that has deteriorated, restoring protective coatings to gates, valves, and metal, and other repair of damage that has resulted from flood events or vandalism.

A plan of operation and maintenance for the channels will be prepared and made a part of the basic operation and maintenance agreement as soon as detailed needs are determined from the design. This basic plan will include, but may not necessarily be limited to regular inspection, reseeding significant areas of vegetation destroyed by erosion, cutting or spraying undesirable trees and shrubs, removing and disposing of debris, adding riprap if needed, keeping access roads for maintenance in good condition, restoring damaged pipe inlets from fields or tributary outlets, and other items as needed to insure stability and successful functioning. The maintenance of improved channels is extremely important from the time of construction until adequate vegetation has been established. The watershed district plans to solicit the support of all landowners along Cypress Creek and its tributaries to report any unusual conditions that develop in the channel so that timely repairs and maintenance can be performed. The district will provide assistance to state and county highway departments for protecting bridge abutments and piling that could influence the proper functioning of the channel.

The operation and maintenance jobs for the minimum basic facilities will include, but may not necessarily be limited to custodial policing, sanitation, safety, and other operational services and maintenance and/or replacement of deteriorated facilities for the evaluated project.

All floodwater-retarding structures and the recreational developments will be operated and maintained in accordance with regulations of the Tennessee Department of Public Health.

Mitigation measures in floodwater-retarding structures and on the flood plain will be operated and maintained in accordance with the project formulation. Water control gates will be closed in the fall immediately after a killing frost or by November 1, whichever occurs first. All areas and pools will be drained by March 1 of the following spring.

The funds needed for operation and maintenance of single-purpose floodwater-retarding structures and stream channels will be furnished by the watershed district through an annual assessment as provided by the authority of the Tennessee Watershed District Act of 1955, as amended.

The funds needed for operation and maintenance of multiple-purpose dam Nos. 4 and 13 and recreational facilities will be furnished by the cities of Ramer and Selmer from regular sources of revenue for their respective developments.

The appropriate city may charge admission or use fee to the recreational development provided such fees do not produce revenues in excess of the local costs required to amortize their initial investment and provide adequate operation and maintenance. If private concessionaires are involved, the cities will be required to establish a schedule of maximum admission or use fees which may be charged to yield a reasonable profit to the concessionaires. The schedule of admission and use fees together with other requirements for operation and maintenance of the recreational facilities must be mutually agreed to by the appropriate city and the Service and set forth in the operation and maintenance agreements.

The local sponsoring organizations will execute specific operation and maintenance agreements prior to obtaining federal financial assistance for land rights, facilities, or project agreements.

An operation and maintenance training session or review will be conducted by the sponsor with involved landowners upon completion of an individual structural measure. The training session to be conducted with involved landowners will establish an understanding of the requirements for operation and maintenance of project measures including mitigation as related to fencing, plowing, grazing, solid waste disposal, management, and other items that might adversely affect the project.

The Service and the sponsors will make a joint inspection annually or after unusually severe floods for 3 years following installation of each structure. Inspection after the third year will be made annually by the sponsors and after unusually severe storms. A report will be prepared by them with a copy to the Service representative. Basic recreational facilities and associated land and water areas devoted

to public recreational purposes will be jointly inspected by the Soil Conservation Service and the cities of Ramer and Selmer at least annually until such time as the Service determines that further participation on this basis is no longer necessary. The Soil Conservation Service will furnish technical guidance or other information necessary for operation and maintenance.

From the beauty of the land
comes the dream of the future.

TABLE 1 - ESTIMATED PROJECT INSTALLATION COST
McNairy-Cypress Creek Watershed, Tennessee

Installation Cost Item 2/	Unit	Number Non-Fed. Land	Estimated Cost (Dollars) 1/ P.L. 566 Funds SCS 3/ Non-Fed. Land	P.L. 566 Funds FS 3/ Non-Fed. Land	P.L. 566 Funds Total	Other Funds SCS 3/ Non-Fed. Land	Other Funds FS 3/ Non-Fed. Land	Other Funds Total	Total
LAND TREATMENT 2/									
Cropland	Acre	13,100	-	-	-	518,900	-	518,900	518,900
Pastureland	Acre	3,450	-	-	-	205,200	-	205,200	205,200
Forest Land	Acre	1,750	-	-	-	-	96,000	96,000	96,000
Other Land	Acre	50	-	-	-	21,000	-	21,000	21,000
Critical Area Stabilization Tree Planting	Acre	3,560	-	82,500	82,500	-	27,500	27,500	110,000
Roadside Stabilization	Acre	400	56,000	-	56,000	56,000	-	56,000	112,000
Critical Area Vegetation	Acre	1,500	132,000	-	132,000	69,000	-	69,000	201,000
Debris Basins	No.	250	31,500	-	31,500	10,500	-	10,500	42,000
Technical Assistance	xxxx	-	162,100	15,500	177,600	49,200	2,100	51,300	228,900
TOTAL - LAND TREATMENT		23,810	381,600	98,000	479,600	929,800	125,600	1,055,400	1,535,000
STRUCTURAL MEASURES									
Construction									
Floodwater-Retarding Strs.	No.	18	1,820,000	-	1,820,000	-	-	-	1,820,000
Multipurpose Structures	No.	2	263,000	-	263,000	172,000	-	172,000	435,000
Channel Modification (M) 4/	Miles	31.19	573,000	-	573,000	-	-	-	573,000
Basic Recreational Facilities	Unit	2	104,000	-	104,000	104,000	-	104,000	208,000
Subtotal - Construction			2,760,000	-	2,760,000	276,000	-	276,000	3,036,000
Engineering Services			579,000	-	579,000	48,000	-	48,000	627,000
Project Administration									
Construction Inspection			240,000	-	240,000	60,000	-	60,000	300,000
Other			318,000	-	318,000	52,000	-	52,000	370,000
Subtotal - Administration			558,000	-	558,000	112,000	-	112,000	670,000
Other Costs									
Land Rights			129,000	-	129,000	971,000	-	971,000	1,100,000
Subtotal - Other Costs			129,000	-	129,000	971,000	-	971,000	1,100,000
TOTAL - STRUCTURAL MEASURES			4,026,000	-	4,026,000	1,407,000	-	1,407,000	5,433,000
TOTAL PROJECT			4,407,600	98,000	4,505,600	2,336,800	125,600	2,462,400	6,968,000

1/ Price base - 1971.
2/ Includes only areas estimated to be adequately treated during the project installation period. Treatment will be accelerated throughout the watershed, and dollar amounts apply to total land areas, not just to adequately treated areas.
3/ Federal agency responsible for assisting in installation of works of improvement.
4/ Type of channel before project: (M) - manmade ditch or previously modified channel.

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TABLE 1A - STATUS OF WATERSHED WORKS OF IMPROVEMENT
McNairy-Cypress Creek Watershed, Tennessee

Measures	Unit	Applied To Date	Total Cost (Dollars)1/
LAND TREATMENT			
Conservation Cropping Systems	Acre	4,900	58,800
Contour Farming	Acre	1,750	10,500
Cover & Green Manure Crops	Acre	3,620	90,500
Crop Residue Use	Acre	3,700	14,800
Diversions	Feet	145,000	23,200
Drainage (Field Ditches)	Feet	75,000	7,500
(Mains & Laterals)	Feet	200,000	36,000
Farm Ponds	Number	150	37,500
Grasses & Legumes in Rotation	Acre	860	43,000
Grassed Waterways	Acre	40	6,000
Hayland Planting	Acre	280	14,000
Pasture Planting	Acre	1,580	79,000
Pasture & Hayland Renovation	Acre	150	7,500
Pasture & Hayland Management	Acre	700	4,900
Stripcropping (Contour)	Acre	20	400
Terraces (Gradient)	Feet	280,000	14,000
(Parallel)	Feet	20,000	2,000
Tree Planting	Acre	6,950	139,000
Hydrologic Stand Improvement	Acre	3,050	45,800
Fire Lanes	Feet	33,000	5,100
Forest Fire Control	Acre	65,250	84,800
TOTAL - LAND TREATMENT	xxxx	xxxx	724,300

1/ Price base - 1971.

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TABLE 2 - ESTIMATED STRUCTURAL COST DISTRIBUTION
McNairy-Cypress Creek Watershed, Tennessee
(Dollars) 1/

Item	Installation Cost - P.L. 566 Funds				Installation Cost - Other Funds				Total Installation Cost
	Construction	Engineering	Land Rights	Total P.L.566	Construction	Engineering	Land Rights	Total Other	
Floodwater-Retarding Structures									
Single-Purpose: 5	65,700	14,700	-	80,400	-	-	26,500	26,500	106,900
6	81,200	18,100	-	99,300	-	-	40,500	40,500	139,800
9	190,300	42,500	-	232,800	-	-	130,200	130,200	363,000
10	139,200	31,100	-	170,300	-	-	42,000	42,000	212,300
11	103,300	23,000	-	126,300	-	-	44,200	44,200	170,500
14	71,100	15,900	-	87,000	-	-	12,800	12,800	99,800
15	91,500	20,400	-	111,900	-	-	24,500	24,500	136,400
16	103,600	23,100	-	126,700	-	-	21,200	21,200	147,900
17	100,600	22,500	-	123,100	-	-	14,800	14,800	137,900
18	69,900	15,600	-	85,500	-	-	7,200	7,200	92,700
19	89,900	20,100	-	110,000	-	-	20,500	20,500	130,500
23	85,600	19,100	-	104,700	-	-	19,200	19,200	123,900
25	88,300	19,700	-	108,000	-	-	21,500	21,500	129,500
28	113,200	25,300	-	138,500	-	-	45,800	45,800	184,300
29	111,900	25,000	-	136,900	-	-	44,000	44,000	180,900
30	110,700	24,700	-	135,400	-	-	65,500	65,500	200,900
35	93,000	20,800	-	113,800	-	-	29,200	29,200	143,000
36	111,000	24,800	-	135,800	-	-	28,500	28,500	164,300
Subtotal	1,820,000	406,400	-	2,226,400	-	-	638,100 2/	638,100	2,864,500
Multiple-Purpose Str. No. 4	87,000	25,000	29,000	141,000	13,000	-	38,000	51,000	192,000
Recreation Facilities	55,000	10,000 3/	7,000	72,000	55,000	10,000 3/	7,000	72,000	144,000
Subtotal	142,000	35,000	36,000	213,000	68,000	10,000	45,000	123,000	336,000
Structure No. 13-Joint Cost (Dam)	176,000	56,000 4/	86,000	318,000	144,000	24,000 4/	116,000	284,000	602,000
Spec. Cost (Wtr.Out.Str.)	-	-	-	-	15,000	4,000	-	19,000	19,000
Recreation Facilities	49,000	10,000 3/	7,000	66,000	49,000	10,000 3/	7,000	66,000	132,000
Subtotal	225,000	66,000	93,000	384,000	208,000	38,000	123,000	369,000	753,000
Channel Improvement (M)	573,000	71,600	-	644,600	-	-	164,900	164,900	809,500
Subtotal	2,760,000	579,000	129,000	3,468,000	276,000	48,000	971,000	1,295,000	4,763,000
Project Administration	xxxx	xxxx	xxxx	558,000	xxxx	xxxx	xxxx	112,000	670,000
GRAND TOTAL	2,760,000	579,000	129,000	4,026,000	276,000	48,000	971,000	1,407,000	5,433,000

1/ Price base - 1971.
2/ Incl. $48,000 for relocation, modification, or alteration of a barn, 2,400 ft. of paved road, 4,600 ft. of gravel road, and three bridges.
3/ & 4/ Includes cost of an A&E contract.
5/ Type of channel before project - (M)-manmade ditch or previously modified channel.

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TABLE 2A - COST-ALLOCATION AND COST-SHARING SUMMARY
McNairy-Cypress Creek Watershed, Tennessee
(Dollars) 1/

Item	Cost-Allocation				Cost-Sharing						
	Purpose				P.L. 566			Other			
	Flood Prevention	Recre-ation	Indus-trial Water Supply	Total	Flood Preven-tion	Recre-ation	Total	Flood Preven-tion	Recre-ation	Indus-trial Water Supply	Total
Single-Purpose											
18 FWRS, Mitigating Measures, & Stream Channel Alteration	3,674,000	0	0	3,674,000	2,871,000	0	2,871,000	803,000	0	0	803,000
Multiple-Purpose											
Ramer Dam No. 4	101,500	90,500	0	192,000	92,500	48,500	141,000	9,000	42,000	0	51,000
Ramer Basic Rec. Facilities	0	144,000	0	144,000	0	72,000	72,000	0	72,000	0	72,000
Selmer Dam No. 13											
(Joint Cost)	162,000	292,000	148,000	602,000	160,000	158,000	318,000	2,000	134,000	148,000	284,000
(Spec. Cost)	0	0	19,000	19,000	0	0	0	0	0	19,000	19,000
Selmer Basic Rec. Facilities	0	132,000	0	132,000	0	66,000	66,000	0	66,000	0	66,000
GRAND TOTAL	3,937,500	658,500	167,000	4,763,000	3,123,500	344,500	3,468,000	814,000	314,000	167,000	1,295,000

1/ Price base - 1971.

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TABLE 2B - ESTIMATED CONSTRUCTION COST OF RECREATIONAL FACILITIES
McNairy-Cypress Creek Watershed, Tennessee
(Dollars) 1/

Item	Unit	Est. Unit Cost	Ramer Site 4		Selmer Site 13	
			No. of Units	Total Const. Cost	No. of Units	Total Const. Cost
1. Roads						
a. Doub. Lane, Paved Surf.	Feet	4.25	4,500 2/	19,125	2,300 2/	9,775
b. Sing. Lane, Paved Surf.	Feet	2.75	2,000 2/	5,500	1,800 2/	4,950
2. Parking Area						
Rock Base, Paved Surf.	Each	60.00	80 2/	4,800	80 2/	4,800
3. Utilities						
a. Water System - Well, Pump, & Distr. Line	Job		1	9,000	1	9,000
b. Electricity & Lighting	Job		1	2,000	1	2,000
4. Sanitary Facilities						
a. Bathhouse & Restroom (Flush Toilet)	Unit		2	9,000	2	9,000
b. Restroom (Flush Toilet)	Unit		2	6,500	2	6,500
c. Septic Tank & Field Lines	Unit		4	7,000	4	7,000
5. Picnic Facilities						
a. Tables (Concrete)	Each	120.00	40 2/	4,800	40 2/	4,800
b. Tables (Hvy. Wood, Treated)	Each	50.00	10 2/	500	10 2/	500
c. Grills	Each	60.00	20 2/	1,200	20 2/	1,200
d. Grills (Masonry)	Each	100.00	1 2/	100	1 2/	100
e. Garbage Cans (Underground Unit)	Each	35.00	25 2/	875	25 2/	875
f. Shelter (Gp.)(20'x40')	Each		1	3,000	1	3,000
6. Camping Facilities Campsite (Incl. 1 Concrete Table, 1 Fire-Place, 1 Park. Spur, Tent Site, Clear. & Grad., & Road)	Unit	500.00	35 2/	17,500	35 2/	17,500
7. Boat Dock & Ramp	Unit	1800.00	1	1,800	1	1,800
8. Landscaping	Acre	200.00	5 2/	1,000	5 2/	1,000
9. Fencing	Feet	0.75	6400 2/	4,800	5,000 2/	3,750
10. Gatehouse	Each		1	1,500	1	1,500
Subtotal				100,000		89,050
Contingencies				10,000		8,950
TOTAL				110,000		98,000

1/ Price base - 1971.
2/ Estimated quantity, subject to minor variations at time of detailed planning.

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TABLE 3 - STRUCTURAL DATA
STRUCTURES WITH PLANNED STORAGE CAPACITY
McNairy-Cypress Creek Watershed, Tennessee

ITEM	UNIT	Structure Numbers			
		4	5	6	9
Class of Structure		b	b	a	b
Drainage Area	Sq.Mi.	2.03	1.78	2.18	9.14
Curve No. (1-day)(AMC II)		70	71	72	71
Tc	Hrs.	1.93	1.71	1.64	3.26
Elevation Top of Dam	Ft.	432.3	431.1	449.8	499.7
Elevation Crest Emer. Spwy.	Ft.	428.3	427.3	447.3	494.3
Elevation Crest High Stage Inlet	Ft.	425.2	423.5	444.0	485.1
Elevation Crest Low Stage Inlet	Ft.	422.0	418.7	440.0	-
Maximum Height of Dam	Ft.	26	25	19	34
Volume of Fill	Cu. Yds.	32,000	24,700	24,700	118,300
Total Capacity	Ac. Ft.	764	532	683	3,257
Sediment Submerged (100-Yr.)	Ac. Ft.	81	104	129	924
Sediment Aerated	Ac. Ft.	14	10	13	87
Beneficial Use (Recreation)	Ac. Ft.	199	-	-	-
Beneficial Use (Indust. Water)	Ac. Ft.	-	-	-	-
Retarding	Ac. Ft.	470	418	541	2,246
Between High & Low Stage	Ac. Ft.	200	186	248	-
Surface Area					
Sediment Pool	Acres	24	26	54	152
Beneficial Use Pool (Recreation)	Acres	52	-	-	-
Beneficial Use Pool (Indust. Water)	Acres	-	-	-	-
Retarding Pool	Acres	113	78	115	345
Principal Spillway					
Rainfall Volume (Areal)(1-day)	In.	7.60	7.60	7.60	7.60
Rainfall Volume (Areal)(10-day)	In.	13.80	13.80	13.80	13.80
Runoff Volume (10-day)	In.	6.75	6.92	7.10	6.92
Capacity of Low Stage (Max.)	cfs	41	31	41	-
Capacity of High Stage (Max.)	cfs	98	94	86	160
Frequency Operation -Emer. Spwy.	% Chance	1	1	1	1
Size of Conduit	In.	30	30	30	36
Emergency Spillway					
Rainfall Vol. (ESH) (areal)	In.	8.30	8.30	5.50	8.30
Runoff Volume (ESH)	In.	4.72	4.82	2.59	4.82
Storm Duration	Hrs.	6	6	6	6
Type		Veg	Veg	Veg	Veg
Bottom Width	Ft.	62	75	40	100
Velocity of Flow (Ve)	Ft./Sec.	4.40	2.81	-1/	3.35
Slope of Exit Channel	Ft./Ft.	0.032	0.0537	-1/	0.0469
Maximum Water Surf. Elev.	Ft.	429.3	427.9	-1/	495.0
Freeboard					
Rainfall Volume (FH) (areal)	In.	15.00	15.00	8.30	15.00
Runoff Volume (FH)	In.	10.85	11.01	4.96	11.01
Storm Duration	Hrs.	6	6	6	6
Max. Water Surf. Elev.	Ft.	432.3	431.1	449.8	499.7
Capacity Equivalents					
Sediment Volume	In.	0.88	1.21	1.22	2.07
Retarding Volume	In.	4.44	4.40	4.65	4.61

(Continued)

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TABLE 3 - STRUCTURAL DATA (Cont.)
STRUCTURES WITH PLANNED STORAGE CAPACITY
McNairy-Cypress Creek Watershed, Tennessee

ITEM	UNIT	Structure Numbers			
		10	11	13	14
Class of Structure		b	b	c	b
Drainage Area	Sq.Mi.	2.40	2.34	3.57	0.87
Curve No. (1-day) (AMC II)		72	75	70	70
Tc	Hrs.	1.98	1.44	2.35	1.27
Elevation Top of Dam	Ft.	492.1	505.2	497.3	504.1
Elevation Crest Emer. Spwy.	Ft.	488.2	501.4	491.6	500.4
Elevation Crest High Stage Inlet	Ft.	481.5	495.3	487.8	497.2
Elevation Crest Low Stage Inlet	Ft.	-	-	-	492.1
Maximum Height of Dam	Ft.	28	29	47	26
Volume of Fill	Cu. Yds.	90,100	58,300	153,200	35,800
Total Capacity	Ac. Ft.	790	1,047	4,046	267
Sediment Submerged (100 Yrs.)	Ac. Ft.	293	482	659	76
Sediment Aerated	Ac. Ft.	29	45	116	7
Beneficial Use (Recreation)	Ac. Ft.	-	-	1,214	-
Beneficial Use (Indust. Water)	Ac. Ft.	-	-	1,214	-
Retarding	Ac. Ft.	468	520	843	184
Between High & Low Stage	Ac. Ft.	-	-	-	86
Surface Area					
Sediment Pool	Acres	50	68	91	15
Beneficial Use Pool (Recreation)	Acres	-	-	175	-
Beneficial Use Pool (Indust. Water)	Acres	-	-	230	-
Retarding Pool	Acres	113	110	291	32
Principal Spillway					
Rainfall Volume (areal)(1-day)	In.	7.60	7.60	7.60	7.60
Rainfall Volume (areal)(10-day)	In.	13.80	13.80	13.80	13.80
Runoff Volume (10-day)	In.	7.10	7.78	6.75	6.75
Capacity of Low Stage (Max.)	cfs	-	-	-	13
Capacity of High Stage (Max.)	cfs	98	100	116	95
Frequency Operation-Emer. Spwy.	% Chance	1	1	1	1
Size of Conduit	In.	30	30	30	30
Emergency Spillway					
Rainfall Volume (ESH)(areal)	In.	8.30	8.30	11.80	8.30
Runoff Volume (ESH)	In.	4.96	5.31	7.86	4.72
Storm Duration	Hrs.	6	6	6	6
Type		Veg	Veg	Veg	Veg
Bottom Width	Ft.	100	100	200	45
Velocity of Flow (Ve)	Ft./Sec.	4.35	3.82	5.77	3.15
Slope of Exit Channel	Ft./Ft.	0.0398	0.0435	0.0327	0.0494
Max. Water Surf. Elev.	Ft.	489.3	502.3	493.3	501.1
Freeboard					
Rainfall Volume (FH)(areal)	In.	15.00	15.00	29.50	15.00
Runoff Volume (FH)	In.	11.17	11.63	24.91	10.85
Storm Duration	Hrs.	6	6	6	6
Maximum Water Surf. Elev.	Ft.	492.1	505.2	497.3	504.1
Capacity Equivalents					
Sediment Volume	In.	2.51	4.22	4.07	1.79
Retarding Volume	In.	3.66	4.17	4.43	3.96

(Continued)

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TABLE 3 - STRUCTURAL DATA (Cont.)
STRUCTURES WITH PLANNED STORAGE CAPACITY
McNairy-Cypress Creek Watershed, Tennessee

ITEM	UNIT	Structure Numbers			
		15	16	17	18
Class of Structure		b	c	c	c
Drainage Area	Sq. Mi.	1.52	1.40	0.97	0.49
Curve No. (1-day)(AMC II)		72	72	71	70
Tc	Hrs.	1.36	1.27	1.41	0.88
Elevation Top of Dam	Ft.	515.0	499.9	492.0	483.2
Elevation Crest Emer. Spwy.	Ft.	510.7	492.5	487.2	478.0
Elevation Crest High Stage Inlet	Ft.	507.3	488.5	483.8	474.6
Elevation Crest Low Stage Inlet	Ft.	502.5	483.0	477.5	468.6
Maximum Height of Dam	Ft.	28	30	29	26
Volume of Fill	Cu. Yds.	50,500	71,900	65,900	36,500
Total Capacity	Ac. Ft.	555	434	262	117
Sediment Submerged (100-Yr.)	Ac. Ft.	179	103	60	27
Sediment Aerated	Ac. Ft.	16	10	6	2
Beneficial Use (Recreation)	Ac. Ft.	-	-	-	-
Beneficial Use (Indust. Water)	Ac. Ft.	-	-	-	-
Retarding	Ac. Ft.	360	321	196	88
Between High & Low Stage	Ac. Ft.	163	150	102	47
Surface Area					
Sediment Pool	Acres	32	24	13	7
Beneficial Use Pool (Recreation)	Acres	-	-	-	-
Beneficial Use Pool (Indust.Water)	Acres	-	-	-	-
Retarding Pool	Acres	62	50	33	14
Principal Spillway					
Rainfall Volume (areal)(1-day)	In.	7.60	7.60	7.60	7.60
Rainfall Volume (areal)(10-day)	In.	13.80	13.80	13.80	13.80
Runoff Volume (10-day)	In.	7.10	7.10	6.92	6.75
Capacity of Low Stage (Max.)	cfs	27	29	22	9
Capacity of High Stage (Max.)	cfs	98	94	100	92
Freq. Operation-Emerg. Spwy.	% Chance	1	1	1	1
Size of Conduit	In.	30	30	30	30
Emergency Spillway					
Rainfall Volume (ESH)(areal)	In.	8.30	11.80	11.80	11.80
Runoff Volume (ESH)	In.	4.96	8.15	8.01	7.86
Storm Duration	Hrs.	6	6	6	6
Type		Veg	Veg	Veg	Veg
Bottom Width	Ft.	50	110	180	100
Velocity of Flow (Ve)	Ft./Sec.	3.25	6.90	5.61	6.05
Slope of Exit Channel	Ft./Ft.	0.0481	0.0292	0.0333	0.0335
Maximum Water Surf. Elev.	Ft.	511.4	494.8	488.9	479.6
Freeboard					
Rainfall Volume (FH)(areal)	In.	15.00	29.50	29.50	29.50
Runoff Volume (FH)	In.	11.17	25.29	25.11	24.91
Storm Duration	Hrs.	6	6	6	6
Max. Water Surf. Elev.	Ft.	515.0	499.9	492.0	483.2
Capacity Equivalents					
Sediment Volume	In.	2.40	1.51	1.28	1.14
Retarding Volume	In.	4.44	4.30	3.79	3.35

(Continued)

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TABLE 3 - STRUCTURAL DATA (Cont.)
STRUCTURES WITH PLANNED STORAGE CAPACITY
McNairy-Cypress Creek Watershed, Tennessee

ITEM	UNIT	Structure Numbers				
		19	23	25	28	29
Class of Structure		b	b	b	b	b
Drainage Area	Sq.Mi.	1.36	0.97	1.08	2.40	1.57
Curve No. (1-day)(AMC II)		71	82	82	82	82
Tc	Hrs.	1.06	1.40	1.20	1.62	1.38
Elevation Top of Dam	Ft.	512.8	467.0	494.2	496.2	495.2
Elevation Crest Emer. Spwy.	Ft.	509.1	464.0	491.6	493.7	492.7
Elevation Crest High Stage Inlet	Ft.	505.3	460.8	488.4	485.5	489.1
Elevation Crest Low Stage Inlet	Ft.	499.8	454.8	482.5	-	484.3
Maximum Height of Dam	Ft.	26	23	25	29	28
Volume of Fill	Cu.Yds.	59,000	45,900	51,800	62,450	65,500
Total Capacity	Ac.Ft.	394	366	396	931	705
Sed. Submerged (100-Yr.)	Ac.Ft.	88	68	71	271	192
Sediment Aerated	Ac.Ft.	9	6	6	26	17
Beneficial Use (Recreation)	Ac.Ft.	-	-	-	-	-
Beneficial Use (Indust.Water)	Ac.Ft.	-	-	-	-	-
Retarding	Ac.Ft.	297	292	319	634	496
Between High & Low Stage	Ac.Ft.	140	148	164	-	239
Surface Area						
Sediment Pool	Acres	18	17	19	61	42
Beneficial Use Pool (Recreation)	Acres	-	-	-	-	-
Beneficial Use Pool (Indust.Water)	Acres	-	-	-	-	-
Retarding Pool	Acres	52	51	58	121	90
Principal Spillway						
Rainfall Volume (areal)(1-day)	In.	7.60	7.60	7.60	7.60	7.60
Rainfall Volume (areal)(10-day)	In.	13.80	13.80	13.80	13.80	13.80
Runoff Volume (10-day)	In.	6.92	9.41	9.41	9.41	9.41
Capacity of Low Stage (Max.)	cfs	25	16	21	-	35
Capacity of High Stage (Max.)	cfs	95	95	98	95	100
Freq. Operation-Emer. Spwy.	% Chance	1	1	1	1	1
Size of Conduit	In.	30	30	30	30	30
Emergency Spillway						
Rainfall Volume (ESH)(areal)	In.	8.30	8.30	8.30	8.30	8.30
Runoff Volume (ESH)	In.	4.82	6.14	6.14	6.14	6.14
Storm Duration	Hrs.	6	6	6	6	6
Type		Veg	Veg	Veg	Veg	Veg
Bottom Width	Ft.	75	75	125	150	100
Velocity of Flow (Ve)	Ft./Sec.	3.70	2.33	2.32	3.93	2.88
Slope of Exit Channel	Ft./Ft.	0.046	0.040	0.040	0.040	0.040
Max. Water Surf. Elev	Ft.	509.8	464.5	492.1	493.7	492.7
Freeboard						
Rainfall Volume (FH)(areal)	In.	15.00	15.00	15.00	15.00	15.00
Runoff Volume (FH)	In.	11.01	12.65	12.65	12.65	12.65
Storm Duration	Hrs.	6	6	6	6	6
Max. Water Surf. Elev	Ft.	512.8	467.0	494.2	496.2	495.2
Capacity Equivalents						
Sediment Volume	In.	1.34	1.44	1.34	2.33	2.50
Retarding Volume	In.	4.10	5.64	5.55	4.96	5.92

(Continued)

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TABLE 3- STRUCTURAL DATA (Cont.)
STRUCTURES WITH PLANNED STORAGE CAPACITY
McNairy-Cypress Creek Watershed, Tennessee

ITEM	UNIT	Structure Numbers 30	35	36	TOTAL
Class of Structure		b	b	b	
Drainage Area	Sq. Mi.	2.75	1.25	1.26	41.33
Curve No. (1-day)(AMC II)		87	82	82	
Tc	Hrs.	1.86	1.41	1.34	-
Elevation Top of Dam	Ft.	467.4	467.7	469.6	-
Elevation Crest Emerg. Spwy.	Ft.	464.3	464.9	466.8	-
Elevation Crest High Stage Inlet	Ft.	455.9	461.8	464.0	-
Elevation Crest Low Stage Inlet	Ft.	-	456.9	459.0	-
Maximum Height of Dam	Ft.	29	22	22	-
Volume of Fill	Cu.Yds.	60,350	51,000	66,800	1,224,700
Total Capacity	Ac.Ft.	1,210	485	489	17,730
Sediment Submerged (100-Yr.)	Ac.Ft.	302	105	96	4,310
Sediment Aerated	Ac.Ft.	29	10	10	468
Beneficial Use (Recreation)	Ac.Ft.	-	-	-	1,413
Beneficial Use (Indust. Water)	Ac.Ft.	-	-	-	1,214
Retarding	Ac.Ft.	879	370	383	10,325
Between High & Low Stage	Ac.Ft.	-	191	192	2,260
Surface Area					
Sediment Pool	Acres	73	29	28	843
Beneficial Use Pool (Recreation)	Acres	-	-	-	227
Beneficial Use Pool (Indust.Water)	Acres	-	-	-	230
Retarding Pool	Acres	158	71	78	2,035
Principal Spillway					
Rainfall Volume (areal)(1-day)	In.	7.60	7.60	7.60	-
Rainfall Volume (areal)(10-day)	In.	13.80	13.80	13.80	-
Runoff Volume (10-day)	In.	10.62	9.41	9.41	-
Capacity of Low Stage (Max.)	cfs	-	28	25	-
Capacity of High Stage (Max.)	cfs	93	92	94	-
Freq. Operation-Emer. Spwy.	% Chance	1	1	1	-
Size of Conduit	In.	30	30	30	-
Emergency Spillway					
Rainfall Volume (ESH)(areal)	In.	8.30	8.30	8.30	-
Runoff Volume (ESH)	In.	6.74	6.14	6.14	-
Storm Duration	Hrs.	6	6	6	-
Type		Veg	Veg	Veg	-
Bottom Width	Ft.	100	100	100	-
Velocity of Flow (Ve)	Ft./Sec.	3.37	2.03	1.74	-
Slope of Exit Channel	Ft./Ft.	0.040	0.040	0.040	-
Maximum Water Surf. Elev	Ft.	464.3	465.3	467.2	-
Freeboard					
Rainfall Volume (FH)(areal)	In.	15.00	15.00	15.00	-
Runoff Volume (FH)	In.	13.35	12.65	12.65	-
Storm Duration	Hrs.	6	6	6	-
Max. Water Surf. Elev	Ft.	467.4	467.7	469.6	-
Capacity Equivalents					
Sediment Volume	In.	2.26	1.72	1.56	-
Retarding Volume	In.	5.99	5.55	5.70	-

1/ No flow.

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TABLE 3A - STRUCTURE DATA
CHANNELS
McNairy-Cypress Creek Watershed, Tennessee

Channel No. or Name	Station	Drainage Area (Sq.Mi.)	Capacity (cfs) Req'd	Capacity (cfs) Design	Water Surface Elev.	Hydraulic Gradient (Ft./Ft.)	Channel Dimensions 1/ Bottom	Channel Dimensions 1/ Depth	"n" Value Aged	"n" Value As Built 3/	Velocities Aged	Velocities As Built	Excavation (Cu.Yds.)	Type of Work 2/	Before Project Type of Channel 5/	Before Project Flow Condition 6/
Main Stream																
VS-6	195+00	4.77	230	230	451.0	.00126	90	28	0.045	0.040	2.55	2.86		IV	M	I
VS-7	211+50	11.51	537	537	449.0	.00121	202	58	0.045	0.040	2.66	2.95		IV	M	I
VS-8	258+00	15.97	400	400	445.0	.00086	154	35	0.045	0.040	2.60	2.93		IV	M	I
VS-9	279+00	19.64	445	445	444.0	.00048	216	45	0.045	0.040	2.06	2.31		IV	M	I
VS-10	335+00	22.20	642	642	439.0	.00089	216	43	0.045	0.040	2.97	3.25		IV	M	I
VS-11	366+00	23.87	981	981	438.0	.00032	438	59	0.045	0.040	2.24	2.69		IV	M	I
VS-12	411+00	25.09	2,475	2,475	433.0 4/	.00106	550	64	0.045	0.040	4.50	5.06		IV	M	I
VS-18	449+50	32.28	2,211	2,211	430.0 4/	.00082	588	74	0.045	0.040	3.76	4.23		IV	M	I
VS-19	529+00	35.34	3,347	3,347	422.0	.00101	766	90	0.045	0.040	4.37	4.91		IV	M	I
VS-23	772+50	56.40	3,011	3,011	400.0	.00102	697	84	0.045	0.040	4.32	4.85		IV	M	I
VS-24	848+00	61.90	2,367	2,367	394.0	.00079	565	86	0.035	0.035	4.19	4.19		IV	M	I
VS-25	914+50	103.23	2,314	2,314	389.0	.00075	542	77	0.035	0.035	4.25	4.25		IV	M	I
VS-26	1001+00	109.17	2,400	2,470	383.0	.00067	40	10.5	0.035	0.035	4.22	4.22		III	M	I
VS-27	1077+50	122.21	2,400	2,470	378.0	.00067	40	10.5	0.035	0.035	4.22	4.22		III	M	I
VS-28	1140+00	129.51	2,400	2,542	375.0	.00060	40	11.0	0.035	0.035	4.09	4.09		III	M	I
Outlet	1202+50	130.68	2,400	2,542	372.0	.00060	40	11.0	0.035	0.035	4.09	4.09	200,000	III	M	I
Crooked Creek																
VS-57	410+00	6.06	650	659	432.0 4/	.00211	155	33	0.045	0.040	4.25	4.79		IV	M	I
Muddy Creek																
VS-79	719+00	31.95	1,676	1,676	405.0	.00104	421	58	0.045	0.040	3.98	4.48		IV	M	I
VS-81	753+00	36.41	1,480	1,480	402.0	.00088	410	58	0.045	0.040	3.61	4.06		IV	M	I
VS-82	840+00	37.94	2,306	2,306	395.0	.00080	610	75	0.045	0.040	3.78	4.25		IV	M	I
Indian Creek																
VS-88	972+00	9.70	500	502	388.0	.00140	156	37	0.045	0.040	3.22	3.62		IV	M	I
Caney Creek																
VS-84	910+00	2.82	165	165	393.0	.00175	66	27	0.045	0.040	2.50	2.81		IV	M	I

1/ Channels requiring clearing and snagging, the cross-sectional area and wetted perimeter are shown in the "Bottom" and "Depth" columns, respectively.
2/ III-Cleaning out natural or manmade channel (includes bar removal and major clearing and snagging operation).
IV -Clearing and removal of loose debris within channel section.
3/ Clearing and snagging consists only of removing drifts, fallen trees or brush in the channel and leaving the channel bank vegetation virtually undisturbed.
4/ The water surface elevation of the 100-yr. flood is 436.3 at VS-12, 433.1 at VS-18 and 434.8 at VS-57. The discharge "Q" for the 100-year flood is 3150 cfs at VS-12 and VS-18 and 1050 cfs at VS-57.
5/ M-Manmade ditch or previously modified channel (1911, 1915, 1947).
6/ I-Intermittent - Continuous flow through some seasons of the year but little or no flow through other seasons.

Note: The sand pumping method proposed for this channel excavation will leave the channel side slopes the same as at present.

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TABLE 4 - ANNUAL COST
McNairy-Cypress Creek Watershed, Tennessee
(Dollars) 1/

Evaluation Unit	Amortization of Installation Cost 2/	Operation and Maintenance Cost	Total Annual Cost
Floodwater-retarding structures, stream channel improvement, mitigating measures, multiple-purpose structures, and basic recreational facilities	263,203	52,500	315,703
Project Administration	37,024	::::::	37,024
GRAND TOTAL	300,227	52,500 3/	352,727

1/ Price base - Installation 1971, O&M Adjusted Normalized.
2/ 100 years @ 5-1/2 percent interest.
3/ Includes $14,000 for single-purpose flood prevention measures including mitigation, $28,500 for O&M of the recreational developments and $10,000 for replacement of recreational facilities as needed.

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TABLE 5 - ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE REDUCTION BENEFITS
McNairy-Cypress Creek Watershed, Tennessee
(Dollars) 1/

ITEM	ESTIMATED AVERAGE ANNUAL DAMAGE		Damage Reduction Benefits
	Without Project	With Project	
FLOODWATER			
Crops and Pasture	297,400	105,600	191,800
Other Agricultural	12,400	2,300	10,100
Non-Agricultural			
Road and Bridge	46,800	15,000	31,800
Residential, Commercial, & Industrial Property 2/	77,500	4,000	73,500
Subtotal	434,100	126,900	307,200
SEDIMENT	20,600	2,900	17,700
INDIRECT	62,400	15,200	47,200
TOTAL	517,100	145,000	372,100

1/ Price base - Adjusted Normalized.
2/ Damages may occur from floods greater than the 100-year frequency but were not evaluated.

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TABLE 6 - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

McNairy-Cypress Creek Watershed, Tennessee
(Dollars)

Evaluation Unit	Average Annual Benefits 1/						Average Annual Cost 3/	Benefit-Cost Ratio
	Damage Reduction 2/	Local Secondary	Industrial Water Supply	Redevelopment	Recreation	Total		
Floodwater-retarding structures, multiple-purpose structures, basic recreation facilities, & stream channel improvement	347,100	51,600	30,800	60,950	120,000	610,450	315,703	1.9:1.0
Project Administration	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	37,024	xxxx
GRAND TOTAL	347,100	51,600	30,800	60,950	120,000	610,450	352,727	1.7:1.0

1/ Price base - Adjusted Normalized.
2/ In addition, it is estimated that land treatment measures will provide flood damage reduction benefits of $25,000 annually.
3/ From Table 4.

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TABLE 7 - CONSTRUCTION UNITS
McNairy-Cypress Creek Watershed, Tennessee

Measures in Construction Unit	Annual Benefit 1/ (Dollars)	Annual Cost 2/ (Dollars)
Floodwater-Retarding Structures 3/		
4	10,438	10,609
9, 10, and 11	58,286	41,213
13	33,811	33,266
14, 15, 16, 17, and 18	70,035	33,968
Channel Improvement	95,352	44,733

1/ Price base - Adjusted Normalized.
2/ Price base - See Table 4.
3/ The remaining floodwater-retarding structures may be installed contingent on these construction units.

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INVESTIGATIONS AND ANALYSES

Engineering Surveys

The engineering surveys on McNairy-Cypress Creek Watershed consisted of establishing about 100 miles of vertical control, surveying 149 valley, channel, and road and bridge sections, and preparing topographic maps for 23 structure areas. Vertical control was established in feet with an elevation tolerance of 0.10 times the square root of the distance (m) in miles. Mean sea level was used as the control datum.

The valley cross-sections were surveyed at selected locations to determine valley shape, width, and other hydraulic characteristics for floodrouting purposes. Topographic maps of eight reservoir areas were prepared by a private engineering company using photogrammetry with a contour interval of 5 feet. Reservoir area maps of 15 sites were prepared by the SCS survey team using the plane table and telescopic alidade with a photo enlargement for a base map and using a contour interval of 5 feet. Stage-storage and stage-area data were developed from these maps as well as from USGS quadrangle sheets.

Design

Preliminary design of the 18 single-purpose and 2 multiple-purpose dams was based on the design criteria contained in Engineering Memo SCS-27 (Revised), dated March 19, 1965. Structure classifications were made from a downstream review of the proposed structure locations.

Storage of the expected 100-year sediment accumulation is provided in each of the structures. Sediment distribution in the structure sites was determined using the procedure outlined in TR-12 (Revised), dated January 1968.

Detention volume requirements for all structures were determined from computer routings of the principal spillway hydrographs. The principal spillways are designed to permit flow through the emergency spillway only from the 100-year or larger storm (1% chance), as required by SCS state policy. Structure Nos. 9, 10, 11, 13, 28, and 30 were designed with single-stage principal spillways. All other structures were designed with two-stage principal spillways. The storage between the high and low stages of the two-stage risers is the volume of runoff from the 5-year, 24-hour rainfall taken from U. S. Weather Bureau TP-40. The flowage easement and top of dam elevations were determined from computer routings of the design and freeboard hydrographs. Sites requiring only the minimum size emergency spillway are designed in accordance with the requirements of Engineering Memo SCS-27.

The required peak discharge for channel design was determined from computer routings. Design discharges were calculated using Manning's

Formula with "n" values or roughness coefficients being estimated by procedures given in Supplement "B", Section 5, National Engineering Handbook.

The excavation planned on the lower 4.8-mile reach of Cypress Creek will be confined to removal of sandy fill material from the channel bed. The channel banks which are presently well vegetated and stable, will not be disturbed. Design velocities of 4.09 and 4.22 fps for the excavated reach slightly exceed the maximum allowable velocity of 4.0 fps estimated using Technical Release-25. However, these velocities are not considered excessive since the channel banks will be in an aged condition during construction. Selective clearing on the banks as well as drift and log removal from the channel will be done in the areas where the channel clean-out or excavation is planned.

Geologic investigations were carried out along the sections of channel where excavation is planned to determine the type materials present and the physical characteristics of the soils as related to erosion resistance. Borings were made and samples recovered with a push type hand sampler. Logs of the bank materials showed SM, ML and SM-ML at 0.0' to 3.0' and consistently CL at 3.0' to 8.0'. The CL material is moderately plastic with an estimated PI of 10-20.

Design data taken from Indian Creek Watershed located in adjoining Hardeman County, Tennessee and Benton County, Mississippi was compared with the channel design for Cypress Creek. Indian Creek channel was constructed in 1965 and now appears to be in a stable condition. Logs of borings on Indian Creek indicated ML's and SM at 0.0' to 3.0' and soft, gray, moderately plastic ML at 3.0' to 7.0'. Design velocities ranged from 4.6 fps to over 5.0 fps. Although soil types differ somewhat and the Indian Creek drainage area is less, this data tends to support using velocities exceeding 4.0 fps on Cypress Creek.

An excavated channel with dimensions shown on Table 3A will carry the required peak discharge at a safe velocity. This data was used to estimate the volume of material to be removed. However, further geologic investigations may reveal that the proposed channel clean-out depth as designed is greater than the original depth which sets the limit of the channel clean-out. This will not affect benefits derived from the project since the primary function of this channel segment is to provide an outlet for Cypress Creek rather than carry a specified peak flood flow.

A consultant engineering firm employed by the city of Selmer developed the future industrial water supply needs of 1,400,000 gallons per day. The total required storage to meet this future need is about 1,214 acre-feet. A reservoir operation analysis prepared by the Soil Conservation Service compared favorably with the consultant's recommendations.

Hydrologic

Four conditions in the McNairy-Cypress Creek Watershed were studied.

(1) Present - Condition of the watershed at the time of the survey and the base to which the proposed project is added.

(2) With Future Land Use and Treatment Measures - LU&T measures were added to the first condition and evaluated based on the change in the hydrologic soil cover complex (change in curve number of runoff).

(3) With Future LU&T Measures and Floodwater-Retarding Structures - Floodwater-retarding structures were added to the second condition.

(4) With Future LU&T Measures, Floodwater-Retarding Structures, and Channel Improvement - Channel improvement was the last increment to be added to the project for flood prevention purposes.

The base map used in these evaluations was developed from a photo mosaic and shows drainage patterns, roads, railroads, highways, county boundaries, major pipeline and powerline crossings, city and community locations.

This map was further developed to show the maximum flood plain inundated based on a stereoscopic analysis of aerial photographs using surveyed high water marks as control points.

The flood plain map was used to locate approximately 75 valley cross-sections and 6 road and bridge sections that were surveyed to develop water surface profiles by the computer program outlined in Technical Guide No. 22 for flood plains and constrictions. Stage-discharge, stage-acre, and stage-end area curves required for floodrouting and evaluation purposes, were generated as output from this program.

Rainfall data for historical storms of February 11-14, 1948, and April 29-30, 1963, were developed from U. S. Weather Bureau publications, "Climatological Data" and "Hourly Precipitation Data" for Tennessee and Mississippi. Isohyetal maps were developed for each of these storms based on cumulative rainfall for the various dates at 16 recording and non-recording precipitation stations.

The February 1948 storm began at approximately 8:00 p.m. on February 11 and continued until about 3:00 p.m. on February 14, 1948. The storm produced an average rainfall of about 8.2 inches in about 43 hours. The 1963 storm generated a rainfall of about 4.8 inches in a 14-hour period with over 65 percent or 3.13 inches falling in less than 4 hours.

Hourly distributions for each of the storms were developed based on the recording gages at Savannah, Tennessee and Ripley, Mississippi. These distributions were used to develop incremental hydrographs which were routed and combined to ascertain flood peaks and elevations at selected locations. The elevations were compared and were in reasonable agreement with known flood mark elevations for each of the storms, including the stages as recorded at the stream gage located on Highway 57 near Ramer.

Additional studies made in the analysis of the watershed included the routing of several selected "One-Day Watershed Evaluation Storms" from

the U. S. Weather Bureau Technical Paper No. 40 (TP-40). Rainfalls for selected frequencies of 1-, 2-, 5-, 10-, 25-, and 100-year, 24-hour storms were routed using a Type I "Cumulative Rainfall Table" and average antecedent moisture conditions (AMC II).

Routed peaks for the synthetic series were used as input data for the IBM 1130 Economic Computer Program.

The investigation revealed that the 100-year flood will still reach a depth of approximately 3.5 feet above normal valley elevations in the city of Selmer after the project is installed, but approximately 95 percent of the average annual urban flood damage will be eliminated. Studies showed that it is not economically feasible to install project measures that would completely eliminate flooding in Selmer.

The reservoir operation study for multiple-purpose structure No. 13 was based on a constant demand of 1,400,000 gallons of water per day. This figure was developed by the city through a study of future needs by a consulting engineering firm. Monthly evaoporation and rainfall data were taken from U. S. Weather Bureau climatological bulletins. Rainfall, runoff, and evaporation records for a 20-year period from 1940 through 1959 were used in the reservoir analysis. During this interval, several dry periods were noted, with the major drouth coming during 1954-55. Seepage losses were estimated at 0.10 foot per month. The total required storage to meet the future demand was estimated at about 1,214 acre-feet.

Geologic

All available geologic maps and reports were reviewed for the purpose of noting geologic relationships. The composition of sedimentary layers, their lateral variations, and any other geologic conditions which may affect the structural works were considered.

Preliminary geologic investigations were made at the sites of the proposed floodwater-retarding and multiple-purpose structures. These examinations were made by observation of the surface conditions, inspection of outcrops in gully, channel, and road cuts, and by shallow hand auger borings at selected locations. Test holes were drilled at multiple-purpose site No. 13 with power equipment to determine foundation conditions, types of material available in emergency spillway and borrow areas for construction purposes and overall geologic feasibility of the site.

Quaternary alluvium overlies Cretaceous sediments in the flood plain areas at all the proposed dams. Sites 9 and 10 are underlain by the McNairy Sand and sites 28, 29, and 30 by the Demopolis Marl. The Coon Creek Formation underlies all the remaining sites and is present in the abutments of site 28.

All of the proposed dam sites are geologically feasible, and no unusual conditions that would require out-of-the-ordinary testing or construction costs were observed. Foundation drains for seepage control will be

needed at sites 9 and 10. A positive cutoff of any highly permeable foundation materials appears feasible at most of the other sites.

An adequate quantity of suitable borrow material is available for construction of the dams. Materials excavated from emergency spillways may also be used in the embankments. The presence of a high water table at some of the sites may limit the depth of borrow in the floodplain areas. Construction materials will vary with site conditions but will include CL, ML, SC and SM soils.

Sedimentation

Estimates of sheet erosion were made through the use of Musgrave soil loss predicting equation. Factors considered in this equation are land use and cover condition, percent and length of slopes, maximum 2-year, 30-minute frequency rainfall, and the basic erosion rate of the soils involved. Consideration was also given to changes anticipated in future land use and treatment.

The required sediment storage volume for each reservoir was determined by the procedure outlined in Technical Release No. 12, dated January 1968. Land use on the drainage area of each of the floodwater-retarding or multiple-purpose structures was mapped and tabulated for present conditions. Anticipated land use changes and treatment applied with project installed were used in determining future rates of erosion. Detailed calculations of six of the drainage areas were made to determine the present and future average annual rates of sheet erosion for the different land uses. These rates, representative for the upland area, were used to determine the average annual rates of sheet erosion of the other areas. The erosion rates of gullies, roadsides, and streambanks were estimated for individual source areas. Other factors considered were the percent of the eroded material to be delivered to the site, the trap efficiency of the structure, the volume weight of the deposited sediment, and distribution of the sediment within the reservoir area.

The area and extent of damages caused by deposition of infertile sediment on flood plain lands were determined by detailed investigations at representative cross-sections in the various evaluation reaches. This information was then expanded to determine the damages for each reach. The depth of modern sediment deposits, rate of deposition, and difference in texture and organic content as compared with the buried flood plain soils were considered in estimating losses in productive capacity and potential recovery. Changes in land use necessitated by the deposition and the reduction in crop and pasture yields were also considered in evaluating sediment damages.

Swamping damages induced by the deposition of modern sediment were determined by field mapping and by a comparison of 1940 and 1960 aerial photographs. Those areas that were formerly used for the production of crops and pasture were included in the evaluation. Damages were based mainly on changes in land use brought about by the swamping of these lands.

The reduction in sediment deposition and swamping was based on the expected decrease in future sediment yield and reduction in coarse-grained sediment available for downstream deposition with the project installed. The floodwater-retarding structures will trap a large percentage of the sediment produced and the anticipated changes in land use, treatment, and cover conditions will reduce the future rate of erosion and yield of sediment.

The effectiveness of the project in reducing sediment pollution of stream flow was determined by comparing the estimated average annual suspended sediment concentrations at the mouth of the watershed for "with project" and "without project" conditions.

Land Use and Treatment

The Conservation Needs Inventory for McNairy County provided a guide for determining the land use and conservation treatment needs. Information was also obtained from aerial photographs and by consultation with the local district conservationist. Land use and treatment needs of the flood plain were determined by farmer interview and field inspection.

Soil surveys on McNairy-Cypress Creek Watershed have been made by soil scientists of the Soil Conservation Service. This mapping shows the soil type, slope, and degree of erosion.

Critical sediment producing areas were delineated from aerial photographs and spot checked in the field for accuracy. Roadside critical area was determined by field mapping.

The amount of land treatment now on the ground was determined from farm plans, plus field checks. The land treatment measures to be installed were determined from total needs of the watershed. These needs were then discounted to show only the amounts that can reasonably be applied.

Only those land treatment measures that have a measurable physical effect in reducing floodwater, sediment, or erosion damage are included in the work plan.

Forestry

A systematic field survey showed ground cover, forest and hydrologic conditions, and treatment needs. The survey, supporting data, and information from other agencies and forestry officials determined the amount of remedial measures. The measures recommended contribute to flood reduction and soil stabilization. The forest land treatment measures planned on private land are limited by the expected participation and the length of the installation period.

Fish and Wildlife

A field investigation was conducted, both from the air and on the ground, of the McNairy-Cypress Creek Watershed. Studies and analyses were then made by biologists of the Tennessee Game and Fish Commission,

U. S. Fish and Wildlife Service, and Soil Conservation Service, working together and individually. The analyses included physical characteristics of the stream and watershed as related to the fish and wildlife resources, extent of fish and wildlife species and population, and hunting and fishing pressure and success.

The extent and composition of the fish and wildlife resources in the watershed was determined by the Biology Work Group through interviews with the local Tennessee Game and Fish Commission conservation officers, and through observations and comparisons of this watershed with similar watersheds in West Tennessee and Mississippi where intensive studies have been made. The stream channel improvement for flood prevention was evaluated by the Work Group for the effect on the fish and wildlife resources.

Economic

The methods used in making economic investigations and analyses followed those approved by the Soil Conservation Service in benefit-cost evaluations on land and water resource projects. These methods are in accordance with instructions in the National Economic Guide. Basic data were obtained from local farmers and residents, agricultural workers, state and county highway officials, experiment stations, and agricultural publications. Basic information was obtained by interview with landowners and operators having flood plain land and consisted of the following: present land use and yields; normal flood-free land use and yields; anticipated land use and yields with various degrees of flood protection; information concerning the normal sequence of the various farming operations; estimates of the percent damage to the various crops and pasture by depths of inundation by months or specific flood events; and damage to urban and rural property and other fixed improvements by depths of inundation or by specific storm events.

Adjusted normalized prices were used as a basis for benefit computations, cost of production and cost of operation and maintenance. These adjusted normalized prices were developed from standards and criteria developed by the Interdepartmental Staff Committee of the Water Resources Council, dated April 1966.

The difference in cost of construction of a single-purpose water supply dam at the same location was the basis for determining the benefits for the industrial water supply increment in structure no. 13. This was considered as the least alternative cost of a water supply that would attract industry.

The IBM 1130 computer was used to evaluate probable damages and benefits by use of the "Frequency Method".

Forty-four floodwater-retarding structure sites were selected for evaluation. Seven combinations ranging from 13 to 37 floodwater-retarding structures with four alternate designs for stream channel improvement were studied. Channel improvement was included after it had been determined that the land treatment and floodwater-retarding

structures would not provide an adequate level of flood protection. A comparison of evaluated damages without and with project installed was used to determine flood damage reduction benefits from input physical and economic flood characteristics and their frequency of occurrence. Output data provided benefits from alternative programs to use in project formulation and justification.

Local secondary benefits were evaluated and used in project justification. Secondary benefits from a national viewpoint were not used in the evaluation or justification of this proposed work plan.

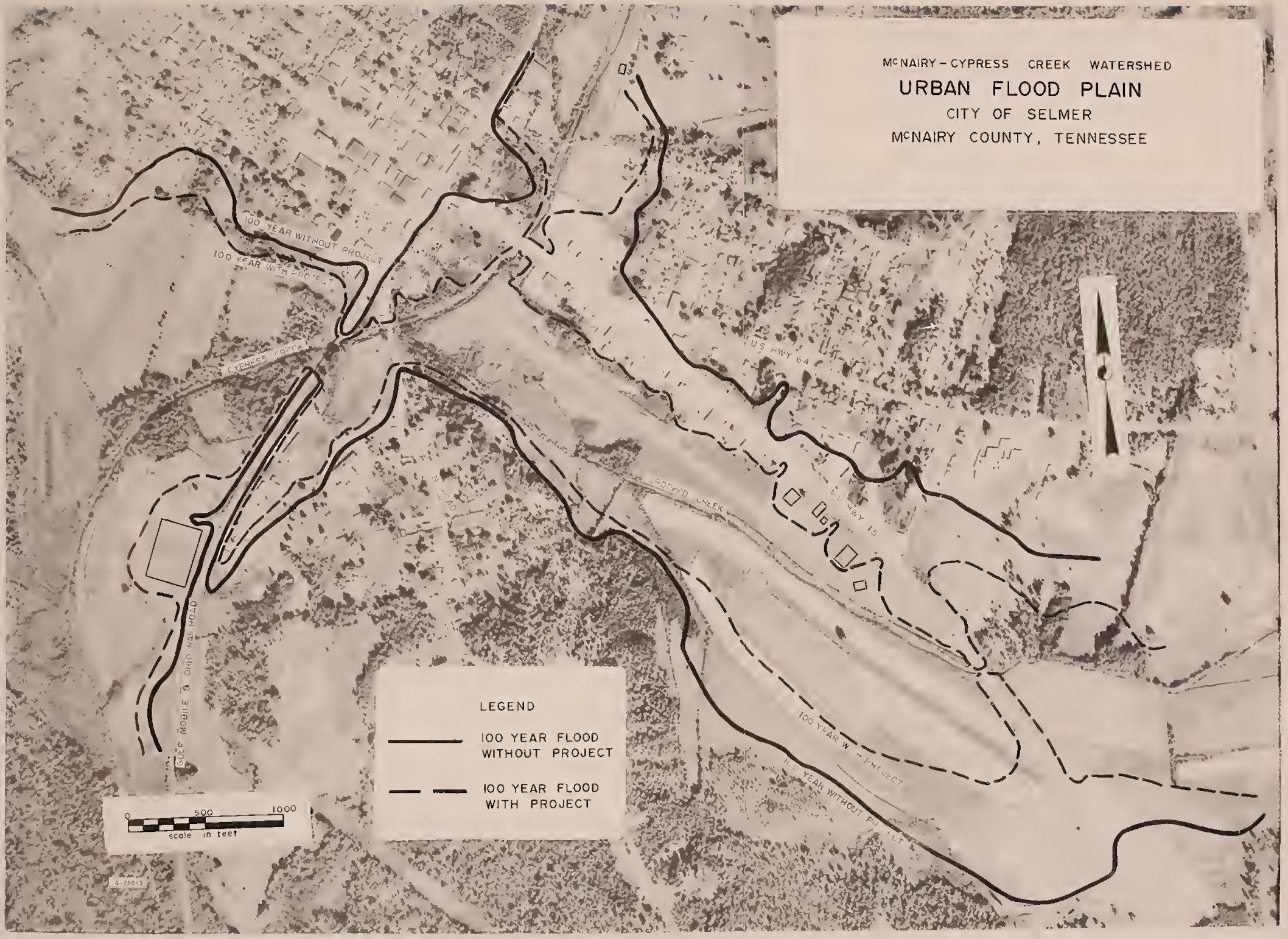
McNairy County's eligibility under the Public Works and Economic Development Act of 1965 enabled the use of benefits for increased employment as a result of the installation of project measures. The value of local labor used in project installation is estimated to be: (1) 30 percent of the construction cost; and (2) 50 percent of the annual operation and maintenance cost on a descending scale for the first 20 years after project installation.

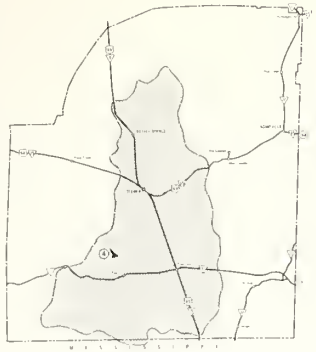
Benefits accruing from fishing, boating, picnicking, hiking, and other related recreation were evaluated and used in the economic justification. Benefits are based on the number of visitor-days of use per year at a value of $1.50 per visitor-day where basic facilities are provided for recreational purposes. It is estimated that the average annual use will be 80,000 visitor-days. There is a population of 750,000 within a 40-mile radius of the facilities.

A 1971 price base was used as the basis for installation costs. The costs of land rights were developed in meetings with the sponsors. A detailed investigation of reservoir areas needed to install the 20 dams included in this plan revealed that no displacement of person, business or farm operations would be required as described in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970. The unit costs of road and bridge relocation, modification or alteration were developed in meetings with state and county highway officials.

Joint costs for construction and engineering services of multiple-purpose structure No. 4 and 13 were allocated by the "Use of Facilities Method." This method provides that costs be allocated by the percent of storage for each purpose as a ratio of the total storage. The specific costs of land to be acquired in fee simple title were allocated to recreation or recreation and industrial water on the basis of surface acreage needed. Flowage easements were allocated to flood prevention, and installation cost of water outlet structure to industrial water.

The 100-year flood will still reach a depth of approximately 3.5 feet in the city of Selmer after the project is installed, although 95 percent of the average annual urban flood damage will be eliminated. It was not economically feasible to install project measures that would completely eliminate all flooding.


McNAIRY – CYPRESS CREEK WATERSHED
URBAN FLOOD PLAIN
CITY OF SELMER
McNAIRY COUNTY, TENNESSEE
100 YEAR WITHOUT PROJECT
100 YEAR WITH PROJECT
CYPRESS CREEK
U.S. HWY 64
U.S. HWY 45
CROCKED CREEK
GULF MOBILE & OHIO RAILROAD
100 YEAR WITH PROJECT
100 YEAR WITHOUT PROJECT
LEGEND
100 YEAR FLOOD WITHOUT PROJECT
100 YEAR FLOOD WITH PROJECT
0
500
1000
scale in feet
4-29013



LOCATION MAP

PURCHASE AREA BOUNDARY

CAMPING AREA

RECREATION POOL EL. 422.0, 52 ACRES

PICNIC AREA

RAMER, TENN

EMERGENCY SPILLWAY ELEVATION

FLOWAGE EASEMENT

PURCHASE AREA BOUNDARY

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
NASHVILLE, TENNESSEE

MULTIPLE — PURPOSE STRUCTURE NO. 4

RECREATION AREA LOCATION MAP

McNAIRY — CYPRESS CREEK WATERSHED

McNAIRY COUNTY, TENNESSEE

0 500 1000
scale in feet

2-70 4-R-28971

USDA SCS FORT WORTH, TEX 1970

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
NASHVILLE, TENNESSEE

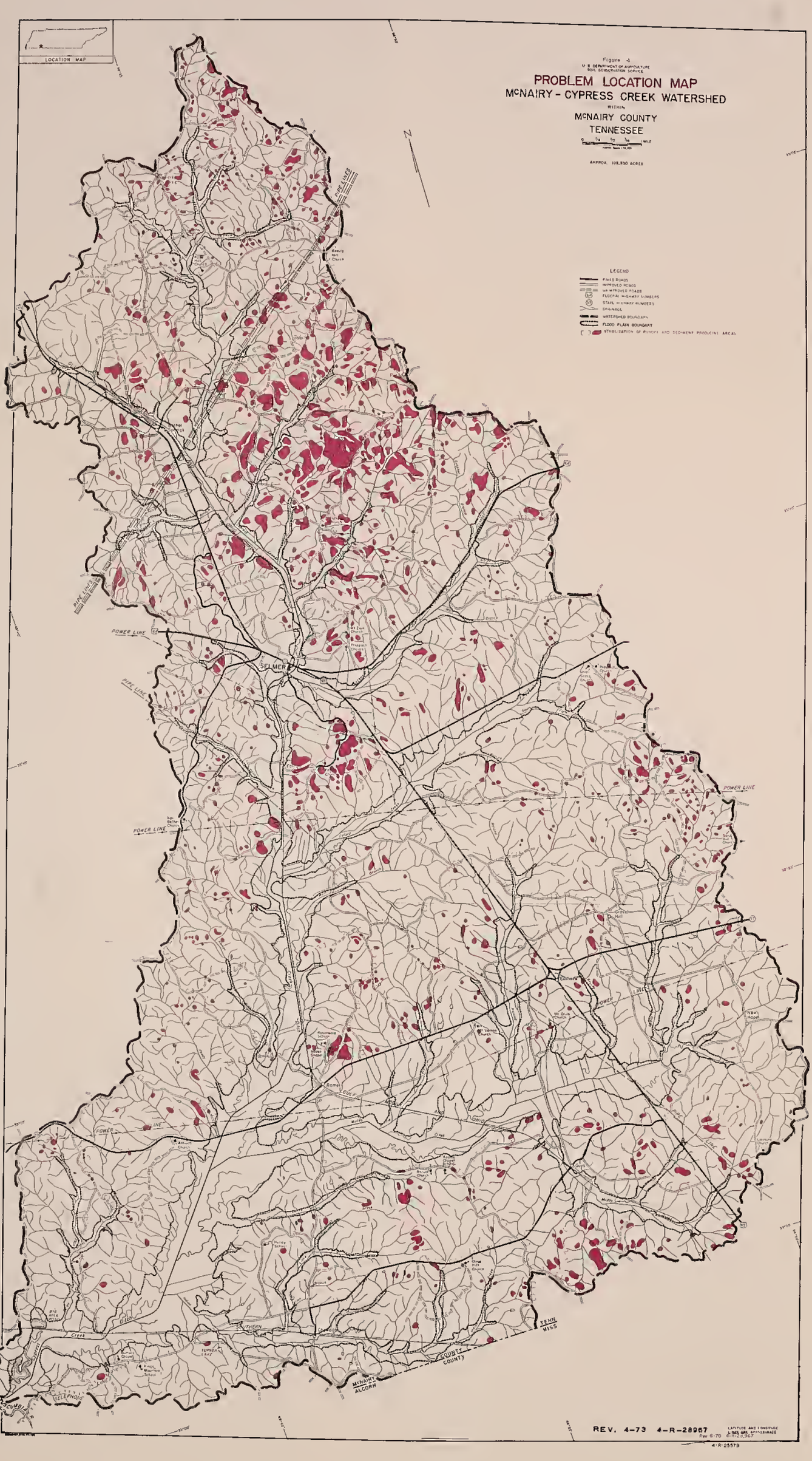
MULTIPLE — PURPOSE STRUCTURE NO. 13

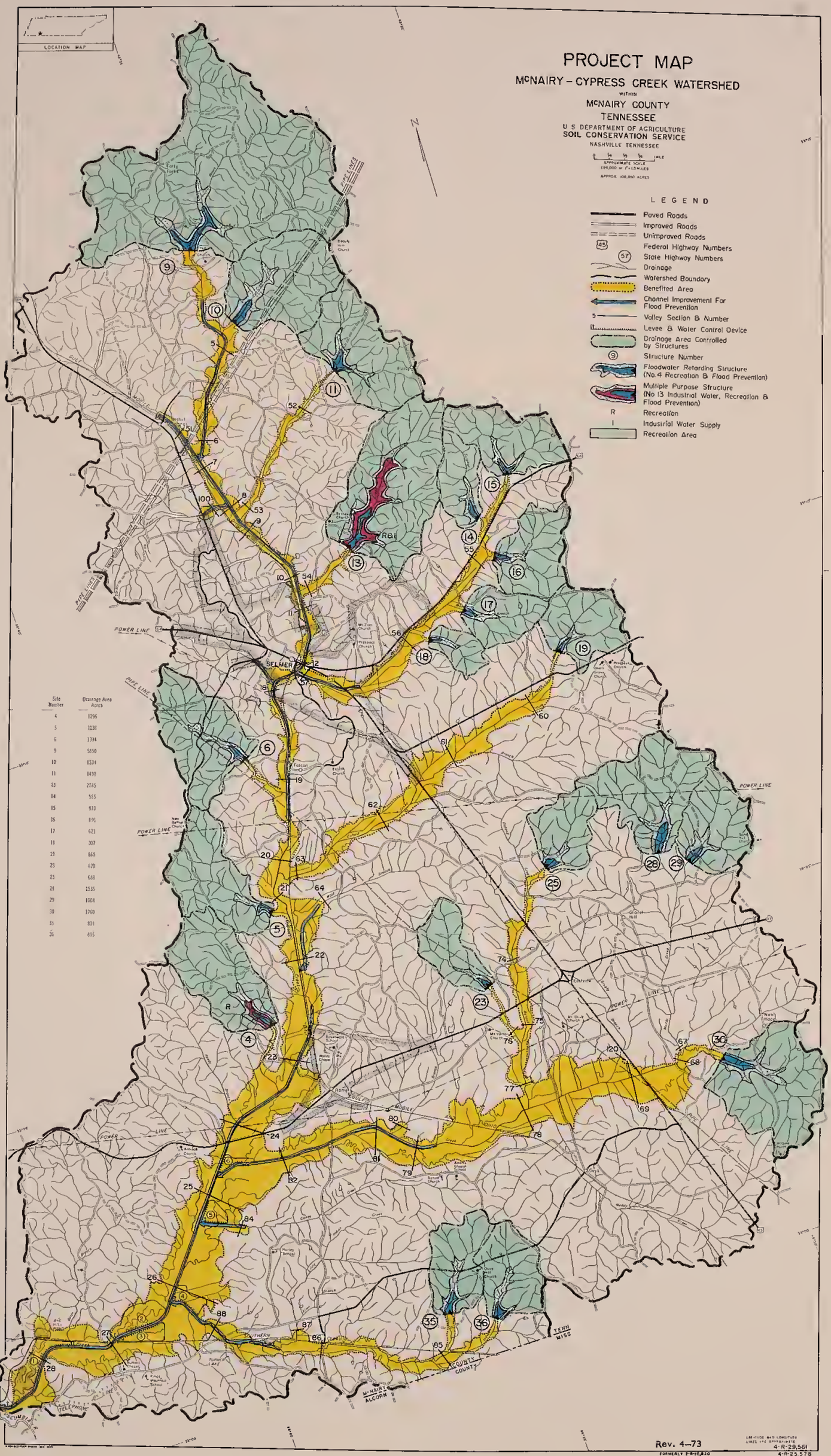
RECREATION AREA LOCATION MAP

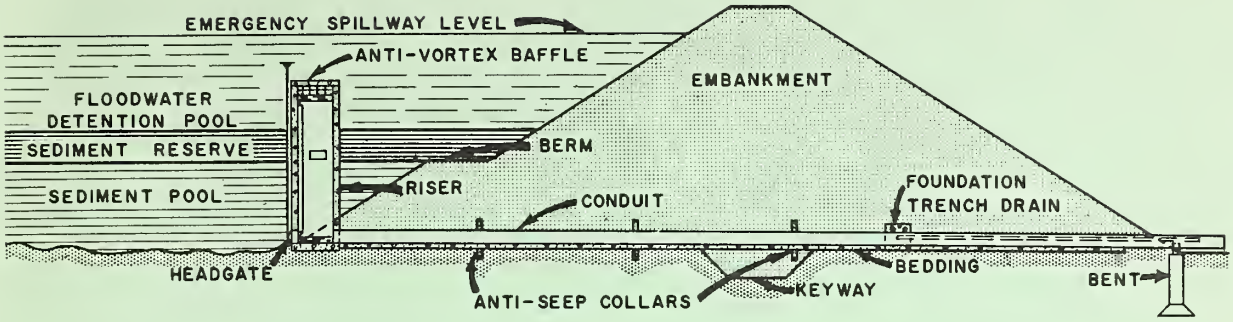
McNAIRY — CYPRESS CREEK WATERSHED

McNAIRY COUNTY, TENNESSEE

2-70 4-R-28970


LOCATION MAP
Figure 1
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
PROBLEM LOCATION MAP
McNAIRY - CYPRESS CREEK WATERSHED
WITHIN
McNAIRY COUNTY
TENNESSEE
APPROX. 108,850 ACRES
LEGEND
PAVED ROADS
IMPROVED ROADS
UNIMPROVED ROADS
FEDERAL HIGHWAY NUMBERS
STATE HIGHWAY NUMBERS
DRAINAGE
WATERSHED BOUNDARY
FLOOD PLAIN BOUNDARY
STABILIZATION OF RUNOFF AND SEDIMENT PRODUCING AREAS
N
SELMER
POWER LINE
PIPE LINE
TELEPHONE
TENN
MISS
McNAIRY
ALCORN
COUNTY
REV. 4-73 4-R-28967
Rev 6-70
4-R-25579

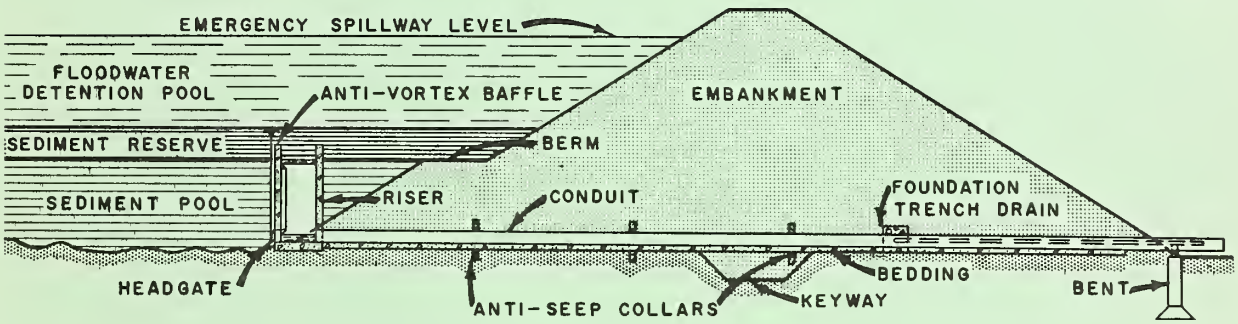

LOCATION MAP
PROJECT MAP
McNAIRY – CYPRESS CREEK WATERSHED
WITHIN
McNAIRY COUNTY
TENNESSEE
U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
NASHVILLE TENNESSEE
APPROXIMATE SCALE
APPROX. 108,800 ACRES
LEGEND
Paved Roads
Improved Roads
Unimproved Roads
Federal Highway Numbers
State Highway Numbers
Drainage
Watershed Boundary
Benefited Area
Channel Improvement For Flood Prevention
Valley Section & Number
Levee & Water Control Device
Drainage Area Controlled by Structures
Structure Number
Floodwater Retarding Structure (No. 4 Recreation & Flood Prevention)
Multiple Purpose Structure (No 13 Industrial Water, Recreation & Flood Prevention)
Recreation
Industrial Water Supply
Recreation Area
Site Number
Drainage Area Acres
4 1296
5 1236
6 1394
9 5850
10 1534
11 1499
13 2745
14 555
15 973
16 896
17 621
18 307
19 865
23 620
25 668
28 2535
29 1004
30 1769
35 801
36 695
SELMER
POWER LINE
PIPE LINE
TELEPHONE
JENN MISS
McNAIRY COUNTY
ALCORN COUNTY
Rev. 4–73
FORMERLY P-R-10,830
4-R-29,561
4-R-29,578



SECTION OF A TYPICAL FLOODWATER RETARDING STRUCTURE

(WITH TWO STAGE RISER)

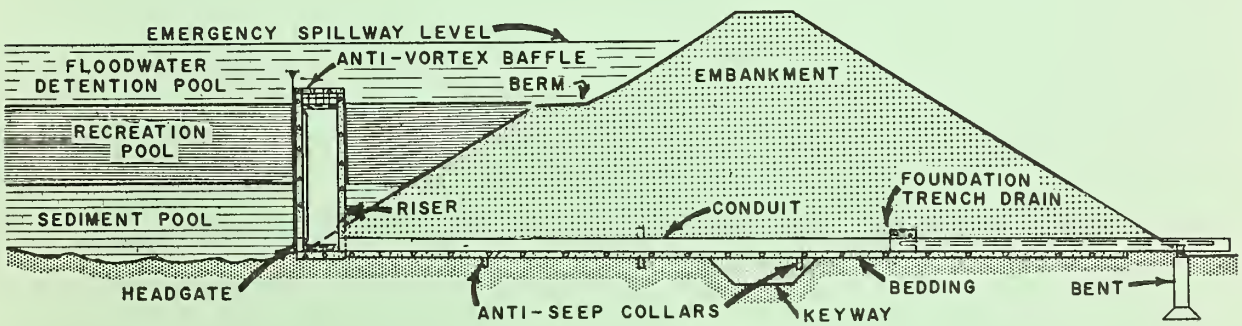
I-67 4-L-23362



SECTION OF A TYPICAL FLOODWATER RETARDING STRUCTURE

(WITH SINGLE STAGE RISER)

I-67 4-L-23364



SECTION OF A TYPICAL MULTIPLE PURPOSE STRUCTURE

(WITH SINGLE STAGE RISER)

USDA-SCS-FORT WORTH, TEX. 1968

8-68 4-L-23363